NASA SP-35
PART 8

SPACE FLIGHT HANDBOOKS VOLUME III

PLANETARY FLIGHT HANDBOOK

Part 8-Jupiter Swingby Missions To Saturn, Uranus, Neptune, And Pluto

General Discussion, Contour Charts And Related Graphical Information

Prepared under contract
for NASA by
General Dynamics

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FOREWORD

This volume of the NASA Planetary Flight Handbook contains trajectory data to aid the mission analyst in planning swingby missions to the planets beyond Jupiter. Data are contained both for Jupiter swingbys to each of the outermost planets individually and for the multi-planet grand tour missions. The volume is a companion to Part 7 of this handbook series which contains direct trajectory data for flights to the outer planets. Together they provide a rather comprehensive catalogue of mission possibilities for the time period 1975 to 1985. Within this decade exist the only opportunities for almost two centuries to exploit the swingby technique to full advantage. Although swingby mission opportunities will occur again in the nearer future, none will offer the possibility of the grand tour or of single planet swingbys to all of the outer planets.

This addition to the NASA SP-35 series of documents was prepared under the direction of Mike Poteet by the Fort Worth Division of General Dynamics under contract NAS 2-4982. In addition to that which is due the study manager, credit is also given to Carolyn Allen for her efforts in preparing the contour charts. Finally, the assistance given by Susan Norman of the Mission Analysis Division in overseeing this activity is gratefully acknowledged.

Jerry Deerwester
NASA/OART Mission Analysis Division
January 1969

CONTENTS

CONTENTS (Cont'd)

SUPPLEMENT*

TABULAR TRAJECTORY DATA FOR JUPITER SWINGBY MISSIONS TO SATURN, URANUS, NEPTUNE AND PLUTO

*Available upon request to the Technical Information Division, Ames Research Center, National Aeronautics and Space Administration, Moffett Field, California 94035

CONTENTS (Cont'd)

SUPPLEMENT

LIST OF TABLES

LIST OF FIGURES

Section 1
GENERAL DISCUSSION

This handbook contains trajectory data and related information for outer-planet swingby missions available during the launch periods 1976 through 1983. Data for two types of missions are included: single-planet (Jupiter) swingbys to Saturn, Uranus, Neptune, and Pluto and multiplanet swingbys composed of sequential encounters with Jupiter, Saturn, Uranus, and Neptune (referred to as grand tour missions). This handbook, Part 8, is a companion volume to Part 7 which contains direct, one-way trajectory data for missions to Jupiter in 1981-1986 and to Saturn, Uranus, and Neptune in 1976-1986 (Reference 1).

Background Information

Recently there has been a considerable effort devoted to the analysis of outer-planet swingby missions (e.g., References 2-8). These studies have centered on the use of Jupiter as the swingby planet, not only because of the large trajectory perturbations it can produce, but also as a result of the consideration of such factors as flight time, departure energy, and availability of post-encounter targets.

The advantages of the swingby mode lie in the marked reduction in total flight time (and, to a lesser extent, the reduction in Earth departure energy) which can be obtained. The flight time improvements are illustrated in Table 1-1 by comparing a swingby mission with a direct mission to the particular target planet at a departure energy equal to the direct Hohmann transfer requirement.* As the departure energy at Earth is increased, the difference between the direct flight time and that obtained with a swingby decreases. However, for missions to the planets beyond Saturn, the flight time difference is still appreciable for departure excess speeds as large as 0.5 EMOS (Table 1-1). It should also

*The Hohmann transfer represents the best possible direct mission and is used here to provide a consistent basis for comparison. It should be noted, however, that actual minimum-energy direct missions during most launch years have significantly different flight times and/or energy requirements due to the effects of orbit inclination.

be noted that swingby missions to the planets beyond Jupiter are available at departure energies less than those necessary for direct Hohmann transfers. This is due to the lower Earth departure excess speed required for the Earth-Jupiter transfer; the remaining energy requirements are attained as a result of the close Jupiter encounter.

TABLE 1-1

FLIGHT TIME COMPARISON, SWINGBY* AND DIRECT

Departure Energy	Flight Time to Target Planet (Days)			
	Saturn	Uranus	Neptune	Pluto
Hohmann				
Direct	2200	5850	11200	16600
Swingby	1180 (1978)	1800 (1979)	2720 (1979)	2750 (1977)
	2270 (1980)	6430 (1983)	>7600 (1983)	7100 (1980)
0.5 EMOS				
Direct	700	1500	2680	>10800
Swingby	660 (1978)	1300 (1979)	1930 (1980)	1970 (1978)
	770 (1980)	1970 (1983)	2750 (1983)	2750 (1980)

* Both the best and the worst swingby mission flight times are shown. The corresponding launch year is given parenthetically.

The next period in which Jupiter swingby missions to the outer planets are available occurs in the mid-1970s through the early 1980s. This period offers a unique opportunity to exploit Jupiter swingbys. The relative planetary alignments are such that single-planet swingby (Earth-Jupiter-target) missions are possible to all of the planets beyond Jupiter. Multiplanet swingby missions to all of the planets beyond Jupiter, with the exception of Pluto, are also possible in this period. In this mission mode, Jupiter encounter is followed by swingbys of one or two additional planets before the target planet is reached.* Since both the single-planet and multiplanet swingbys involve a Jupiter swingby, both of these missions exhibit certain general characteristics, dictated, of course, by the use of Jupiter as the primary swingby planet and the requirement that total flight times remain within reason. These include:

1. An Earth departure opportunity occurs about every 13 months, i.e., essentially, one Earth-Jupiter synodic period.

*Multiplanet swingby data for only the case where Jupiter encounter is followed by two additional swingbys (i.e., grand tour missions) is presented here.

2. There is a span of 5 launch years for which practicable missions exist; there are some opportunities adjacent to this span; however, these exhibit excessive flight times or severely restricted launch windows.
3. The most favorable missions in terms of Earth departure excess speed are those with Type I Earth-Jupiter transfers.
4. The periapsis radii at Jupiter are smallest for the earliest launch year, and increase as the angular separation between Jupiter and the target (or Saturn, in the case of the grand tour missions) decreases (i.e., requiring smaller turn angles at Jupiter or even retrograde Jupiter passages).

For the forthcoming launch period, both single-planet swingbys to each of the outer planets and multiplanet swingbys are possible, but for subsequent launch opportunities, such swingbys will occur at rather diverse intervals. These intervals are essentially governed by the snyodic period of the two outermost planets of the swingby sequence. A tabulation of these periods is given in Table 1-2. As can be seen, each single-planet swingby opportunity occurs at least every 20 years, but a multiplanet mission opportunity of the scale which occurs a decade from now is a rare event. It will not be duplicated for a span of years at least as long as the synodic period of Uranus-Neptune, i.e., 171 years. This single fact is sufficient cause to emphasize the study and

TABLE 1-2

SYNODIC PERIODS OF THE OUTER PLANETS

	Saturn	Uranus	Neptune	Pluto
Jupiter	7250 days (19.9 yrs.)	5050 (13.8)	4670 (12.8)	4550 (12.5)
Saturn	----	16570 (45.4)	13100 (35.9)	12210 (33.4)
Uranus		----	62600 (171.4)	46440 (127.1)
Neptune			---	179850 (492.4)

the utilization of these missions at the next opportunity. To delay would be to miss (to all intent forever) the opportunity to make the most efficient use possible of the swingby mode in terms of available technology and total knowledge to be gained.

Organization

The data in this handbook are contained in two separately bound volumes. The explanatory text and charts are contained in the first volume, while the tabular data are contained in a single supplementary volume. This, the first volume, is divided into four sections. An explanatory text, of which this discussion is a part, comprises Section 1. The table of the planetary constants (used in the trajectory computations and in the auxiliary charts for determining the incremental velocity (ΔV) requirements for departure from Earth and entry into orbit at the target planet, turn angles during planetary encounter, and times within the activity sphere of the swingby planet) are contained in Section 2. Planetary ephemerides for the years 1970 to 2000 are also contained in Section 2. The trajectory data are presented graphically in Sections 3 and 4. The data in Section 3 are for the single-planet swingby missions. These consist of one chart for each mission opportunity. Each chart contains curves of constant Earth departure hyperbolic excess speed, target-planet arrival excess speed, Julian date of Jupiter swingby, and perijove radius, plotted on a grid of Earth departure date and target planet arrival date. Section 4 contains the data for the grand tour missions. These consist of 4 charts for each mission opportunity. Each chart is plotted on a grid of Earth departure date and Neptune arrival date. The first chart contains curves of constant Earth departure excess speed and Neptune arrival excess speed. The second, third, and fourth charts contain curves of constant Earth departure excess speed, Julian date of swingby, and swingby periapsis radius, for the swingby planets Jupiter, Saturn, and Uranus, respectively. The appendix to this volume consists of a description of a data tape which contains a complete record of the tabular trajectory data contained in the supplement. The supplement contains the trajectory data for the single-planet (Jupiter) swingby missions to Saturn, Uranus, Neptune and Pluto and the trajectory data for the grand tour missions. This supplement is available, upon request, from the Technical Information Division, Ames Research Center, National Aeronautics and Space Administration, Moffett Field, California 94035.

Computer Program and Methods

The programs used to obtain the trajectory data are based on the patched-conic technique. Input requirements are: a date of departure, a date of arrival, and the set of mean elements defining the departure and arrival planets' orbits. The planetary orbits are treated as eccentric, mutually inclined ellipses. In order to maintain consistency with previous volumes of the Planetary Flight Handbook, the elements are fixed at their osculating values on 1.5 January 1960. These values are given in Reference 9 and in Section 2 of this volume.

Within the program, the orbital elements are employed to determine the position and velocity of the departure planet and the arrival planet by iteration on Kepler's equation. Given the terminal position vectors and the transfer time, an iterative solution to Lambert's Theorem is used to obtain the elements of the required transfer conic.

The actual determination of the swingby trajectories consists of the specification of the independent variable (date of swingby) for which the excess speeds of arrival and departure at the swingby planet are equal (within a specified tolerance). The basic mechanics of the operation consists of making a series of estimates of the correct swingby date, each time passing through the series of trajectory calculations implied in the paragraph above. After each pass the excess speeds at the swingby planet are compared and the process is either terminated (if the excess speeds have converged) or it is continued by making a new estimate of the swingby date. The manner in which the estimates of swingby date are made involves two basic approaches. One approach, used in the single-planet swingby program, requires that the range of possible swingby dates be specified. This range is divided into a desired number of increments and all the Earth-swingby planet and the swingby planet-target planet transfer conics are determined. For each specified Earth departure date/target-planet arrival date, the swingby arrival and departure excess speeds for each encounter date are subtracted and sequentially compared. An algebraic sign change between successive differences indicates the existence of a solution, i.e., the swingby date lies between the two dates at the swingby planet corresponding to these differences. A linear interpolation scheme is then used to determine the swingby date. The second method, used in the multiplanet swingby program, employs a matrix of sensitivities of the excess speed inequality with respect

to the swingby date to correct an initial set of estimates of the swingby dates. This method simultaneously varies each swingby date until the sum of the squares of the differences in departure and arrival excess speed at the respective swingby planets falls within a specified tolerance. Both of these iterative procedures are repeated until the difference between the arrival and departure excess speeds at the swingby planet is less than or equal to 15 m/sec.

These methods are based on the assumption that the only effect of a close planetary encounter is to rotate the hyperbolic excess velocity vector. This assumption is valid for the degree of accuracy implied in preliminary design data; however, it should be mentioned that meaningful errors in flight time can be introduced when the gravity field effects of the Jovian planets are not considered.

Magnetic Tape of Trajectory Data

The data contained in the supplement has been stored on magnetic tape in order to provide access to the trajectory data in a form suitable for direct use by computer programs employed in mission or system studies. The tape is written in a 7-track, blocked BCD format with 20 records per block and is compatible with the 7090/7094 DCS. A detailed description of the organization of the data on the tape is contained in the Appendix.

A copy of the tape may be obtained by submitting a request to the Director, Mission Analysis Division, Office of Advanced Research and Technology, National Aeronautics and Space Administration, Moffett Field, California 94035. A standard magnetic tape, 2400 feet in length and 1/2 inch in width must accompany the request. The trajectory data will be written on the tape at a density of 800 bits per inch unless another tape density is specified (e.g., 200 bpi or 556 bpi).

Section 2

PLANETARY EPHEMERIDES, CONSTANTS, AND RELATED INFORMATION

This section contains the planetary constants and ephemerides used in the calculation of the interplanetary trajectories. Other information of use to the mission analyst is also included.

The constants used in the trajectory calculations for this handbook are listed in Table 2-1 and were taken from Reference 9 with the exception of the value of the planetary gravitational parameter. This was obtained analytically from the ratio of planetary mass to solar mass and the value of the solar gravitational parameter (1.327×10^{11} km^3/sec^2).

The turn angle, K, through which the hyperbolic asymptote of the encounter trajectory is deflected is shown in Figures 2-1 through 2-4 for the four

TABLE 2-1

PLANETARY CONSTANTS

	Earth	Jupiter	Saturn	Uranus	Neptune	Pluto
Semimajor Axis (AU)	1.0	5.202803	9.538843	19.18195	30.05778	39.43871
Eccentricity	0.016726	0.048435	0.055682	0.047209	0.008575	0.250236
Sidereal Period (days)	365.2564	4332.587	10759.2	30685.2	60189.5	90465.4
Inclination (deg)	0.0	1.30536	2.48991	0.77306	1.77375	17.1699
Longitude of Ascending Node (deg)	0.0	100.0444	113.3075	73.79630	131.3398	109.8856
Argument of Perihelion (deg)	102.2525	273.6338	338.9570	96.21453	272.9342	114.2746
Mean Anomaly at Epoch* (deg)	357.9056	246.1529	188.4069	331.2941	172.6670	316.4295
Planet Radius (km)	6374.9	71335.2	60370.4	23523.4	22312.2	7012.4
Gravitational Parameter (km^3/sec^2)	398626.2	126700378.0	37897039.0	5802627.0	6870678.0	368612.0
True Anomaly of "Vernal Equinox" (deg)	-102.27	122.7	-98.0	176.2	145.5	**
Equatorial Obliquity (deg)	23.450	3.067	26.556	97.883	28.8	**

* 1.5 January 1960 (JD 2436935.0)

** Unknown; defined as 0.0 for data computation

Jovian planets. The data are presented as a function of periapsis radius for specific values of excess speed. The data were obtained from the equation

$$K = 2 \arcsin\left[1 + \frac{r_p V_\infty}{\mu}\right]^{-1}$$

where r_p is the periapsis radius, V_∞ is the excess speed and μ is the planetary gravitational parameter.

Shown in Figure 2-5 are the flight times between the boundary of the activity sphere and periapsis for encounter trajectories at the Jovian planets. The times are given as a function of hyperbolic excess speed. The data were computed from the equation

$$T = n\left[e \tan H - \ln \tan (\pi/4 + H/2)\right]$$

where n is the mean angular motion, e is the eccentricity, and H is the auxiliary angle of the hyperbola at the activity sphere boundary. The auxiliary angle, H, is defined as arc-cos $\left(ae/(a + r)\right)$, where a is the semimajor axis of the hyperbola and r is the radius. As can be seen, the flight time within the activity sphere is also a function of periapsis radius; however, this effect is not explicitly shown in Figure 2-5. Instead, the mean values of the actual flight times are shown since the flight time is relatively insensitive to periapsis radius over the range from 1 to 100 planet radii. The maximum difference between the actual flight time and that shown in the figure occurs at the lowest excess speed, i.e., 0.2 EMOS. The maximum difference at this speed is $\pm$3.0 days at Jupiter, $\pm$1.5 days at Saturn, and $\pm$0.5 days at Uranus and Neptune. As the excess speed increases the difference decreases: at 0.3 EMOS the maximum difference is about $\pm$1.0 days at Jupiter, $\pm$0.5 days at Saturn, and $\pm$0.2 days at Uranus and Neptune.

It should be noted that the time within the activity sphere shown in Figure 2-5 is not a direct error in transfer time to the planet. The actual error is less since the patched conic analysis assumes motion to the planet's center. The actual error in trip time is approximately equal to the difference between the time shown in Figure 2-5 and the linear flight time within the activity sphere, where the linear flight time is equal to the radius of the activity sphere divided by the hyperbolic excess speed.

The ΔV required to depart from a 185-km circular orbit at Earth is shown in Figure 2-6 as a function of hyperbolic excess speed. Figures 2-7 through 2-14 show the ΔV requirements for orbit insertion at each of the four target planets

(Saturn, Uranus, Neptune, and Pluto). The illustrations are divided into two figures for each planet. The first figure gives the insertion requirement (for specified values of arrival excess speed) for entry into a circular orbit as a function of periapsis radius; the range considered is 1 to 15 planet radii. It should be mentioned that there is a distinct value of periapsis radius for each hyperbolic excess speed that yields a minimum insertion requirement. The value of periapsis radius which yields the minimum insertion ΔV for a specified capture-orbit eccentricity and arrival excess speed is given by

$$r = \frac{2\mu}{V_\infty^2}\left[\frac{1 - e}{1 + e}\right]$$

where μ is the gravitational parameter, V_∞ is the excess speed, and e is the eccentricity. The second figure for each planet shows the reductions in ΔV requirements obtained by entry into an elliptical orbit with a given periapsis radius instead of a circular orbit of the same radius. The ΔV reduction is a function of the periapsis radius and eccentricity only and is equal to

$$V_r = V_c\ (\sqrt{1 + e} - 1)$$

where V_c is the local circular velocity and e is the desired orbital eccentricity. Eccentricities from 0 to 1 are considered at specific values of periapsis radius up to 15 planet radii.

The remainder of this section contains the ephemerides of Earth, Jupiter, Uranus, Neptune, and Pluto for the years 1970-2000. The following information is given: heliocentric radius, heliocentric longitude and latitude, and the right ascension and declination of the sun. In addition, the communication distance from Earth is printed for the five target planets. The angles are expressed in degrees, and the distances in AU. The ephemerides were generated using the fixed-ellipse model of the planetary orbits as described by the elements in Table 2-1. These values are not the most accurate ones available; however, they are sufficiently accurate for preliminary design purposes and make this handbook consistent with the previous volumes of the "Planetary Flight Handbook." An estimate of the error induced by the fixed-ellipse data was obtained by comparing the fixed-ellipse data with that obtained using time-varying planetary elements. The discrepancies were approximately 0.5 degrees in heliocentric longitude for all planets in the year 2000. This is the upper bound on the error since the errors are largest for the later years.

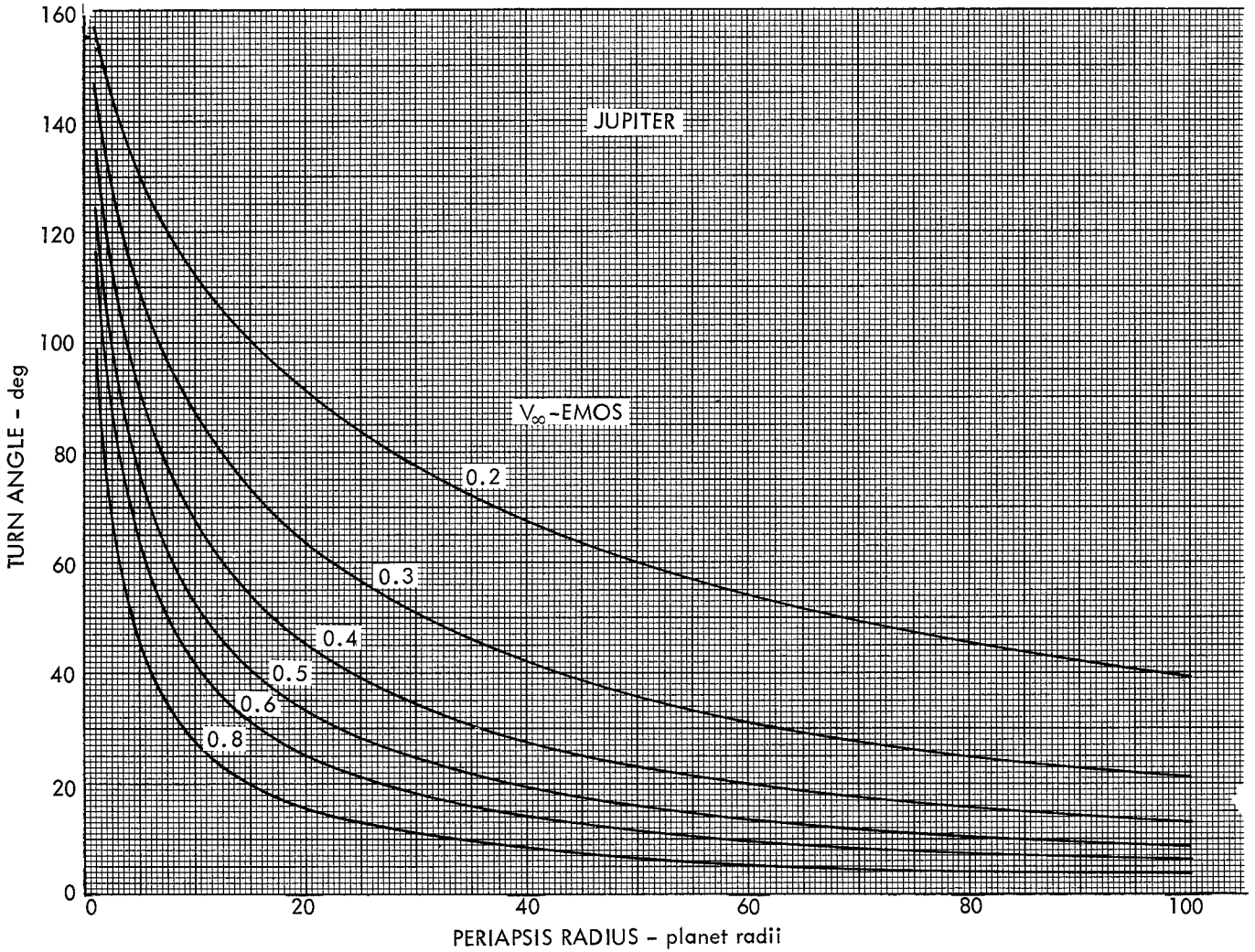

FIGURE 2-1 HYPERBOLIC ASYMPTOTE TURN ANGLE AT JUPITER

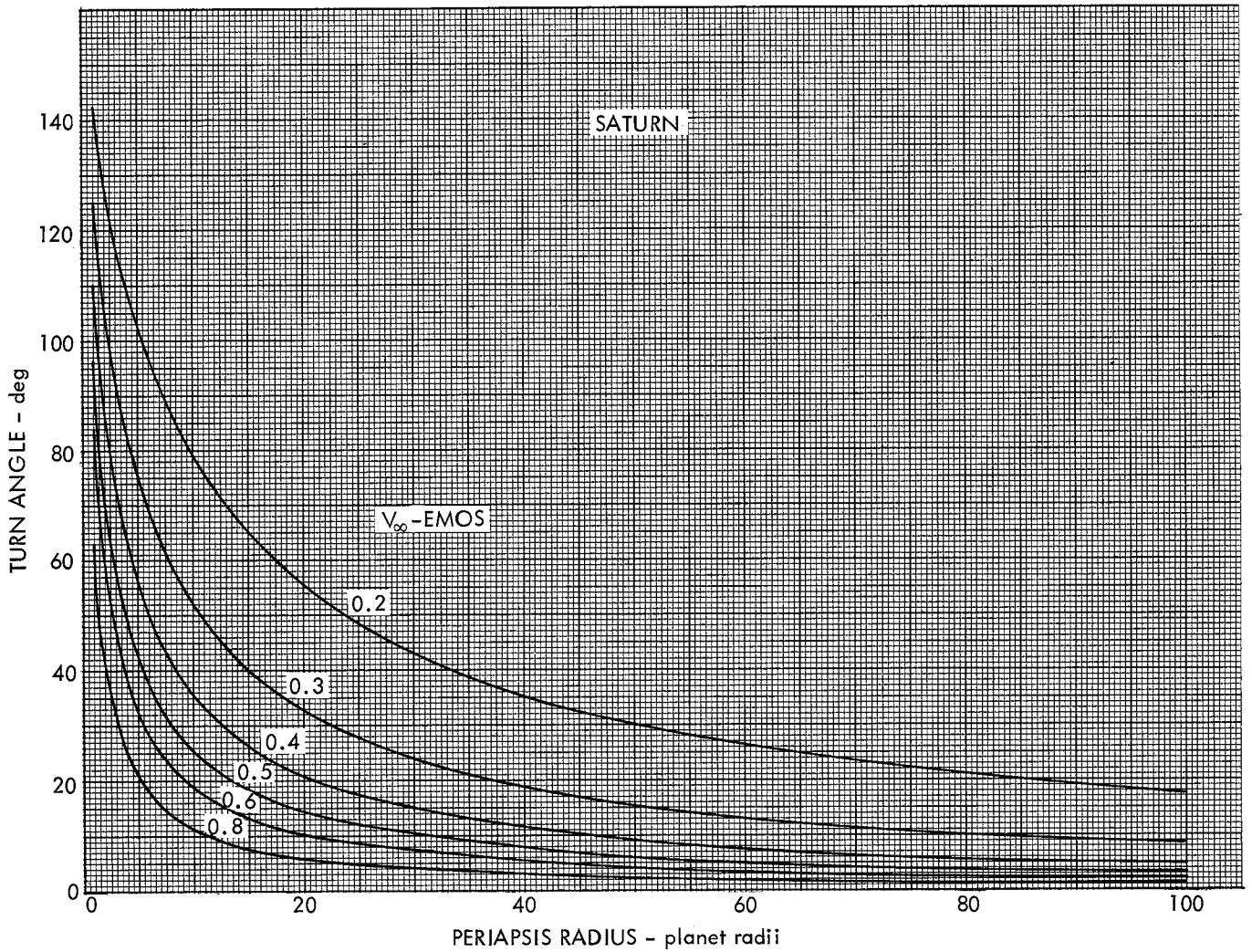

FIGURE 2-2 HYPERBOLIC ASYMPTOTE TURN ANGLE AT SATURN

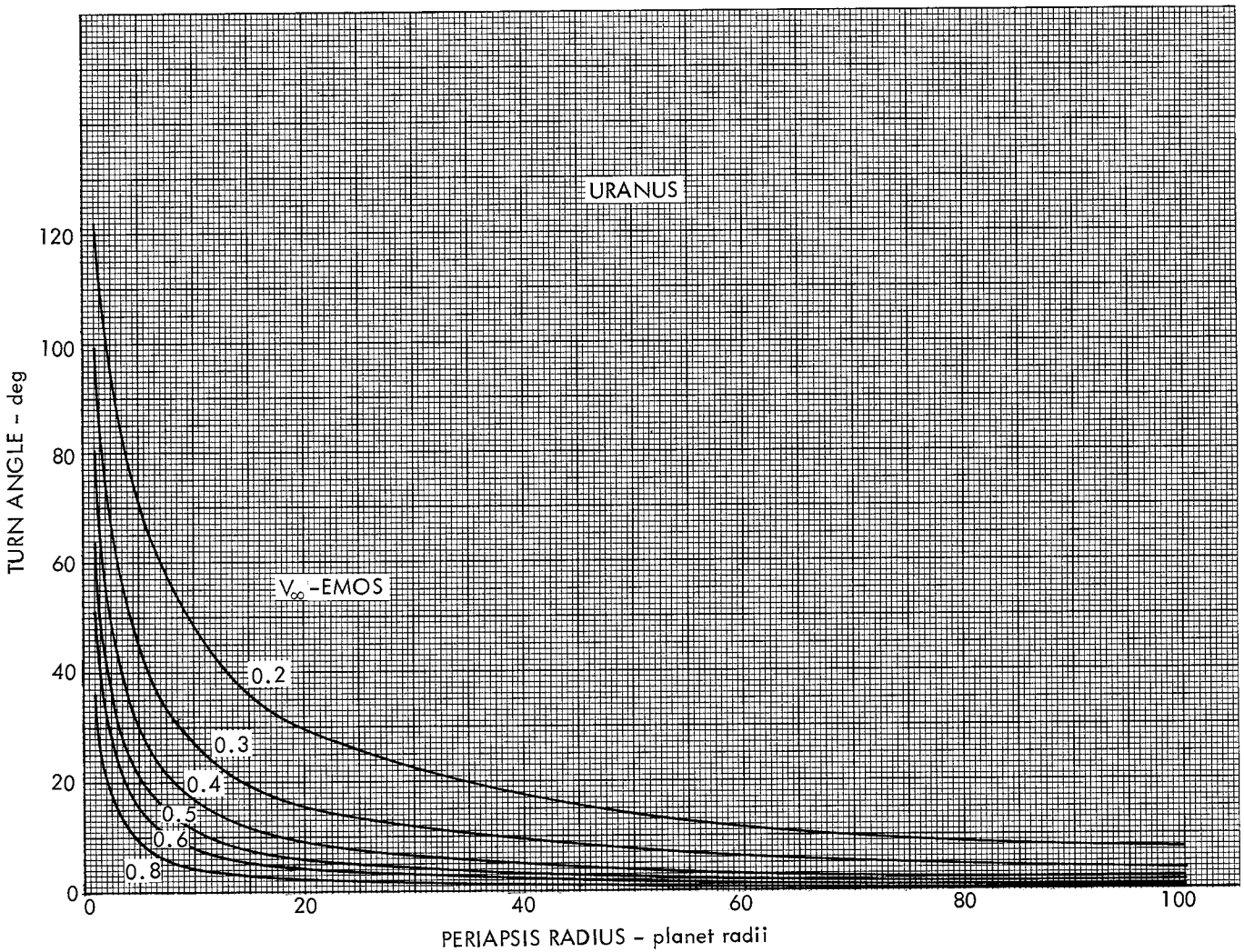

FIGURE 2-3 HYPERBOLIC ASYMPTOTE TURN ANGLE AT URANUS

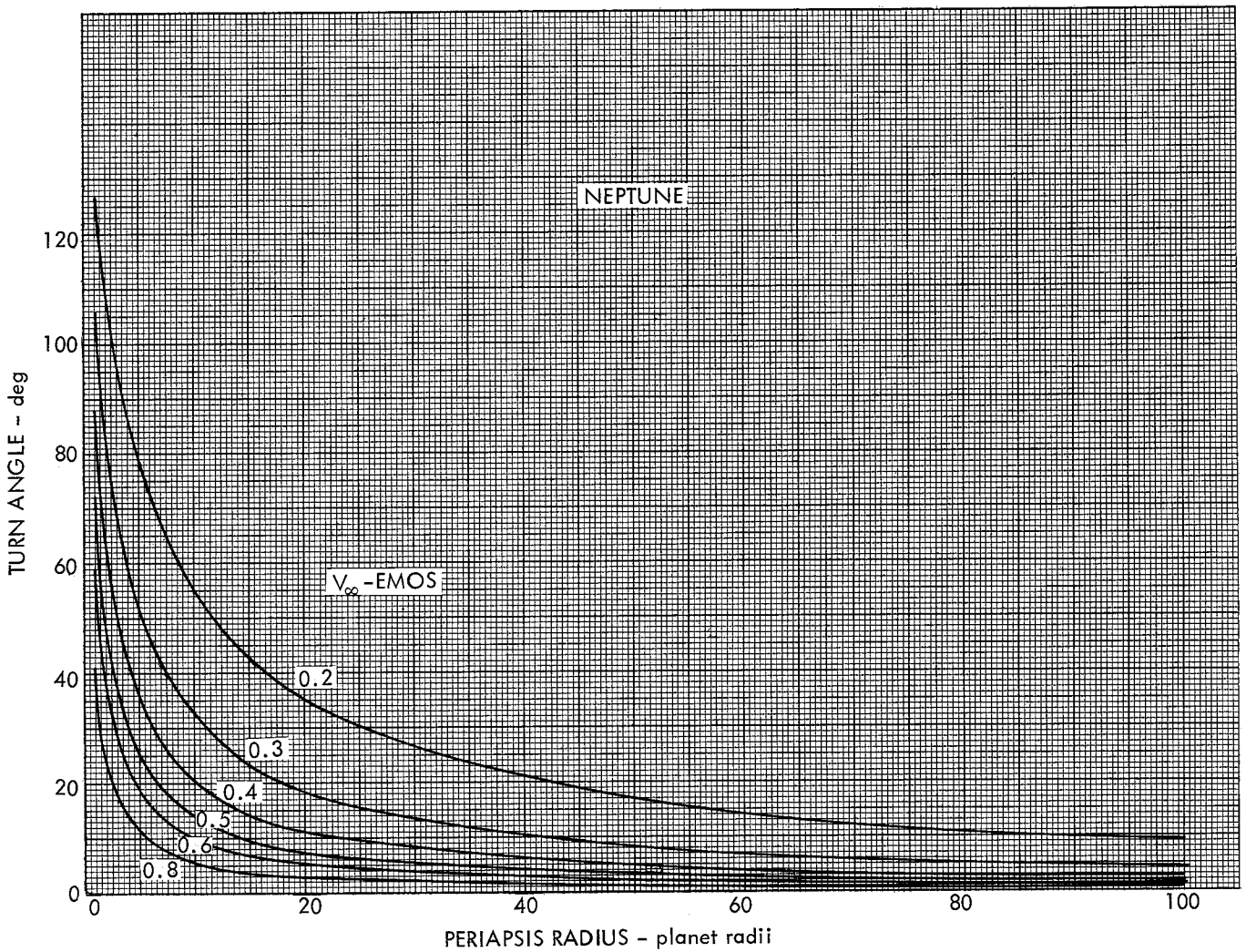

FIGURE 2-4 HYPERBOLIC ASYMPTOTE TURN ANGLE AT NEPTUNE

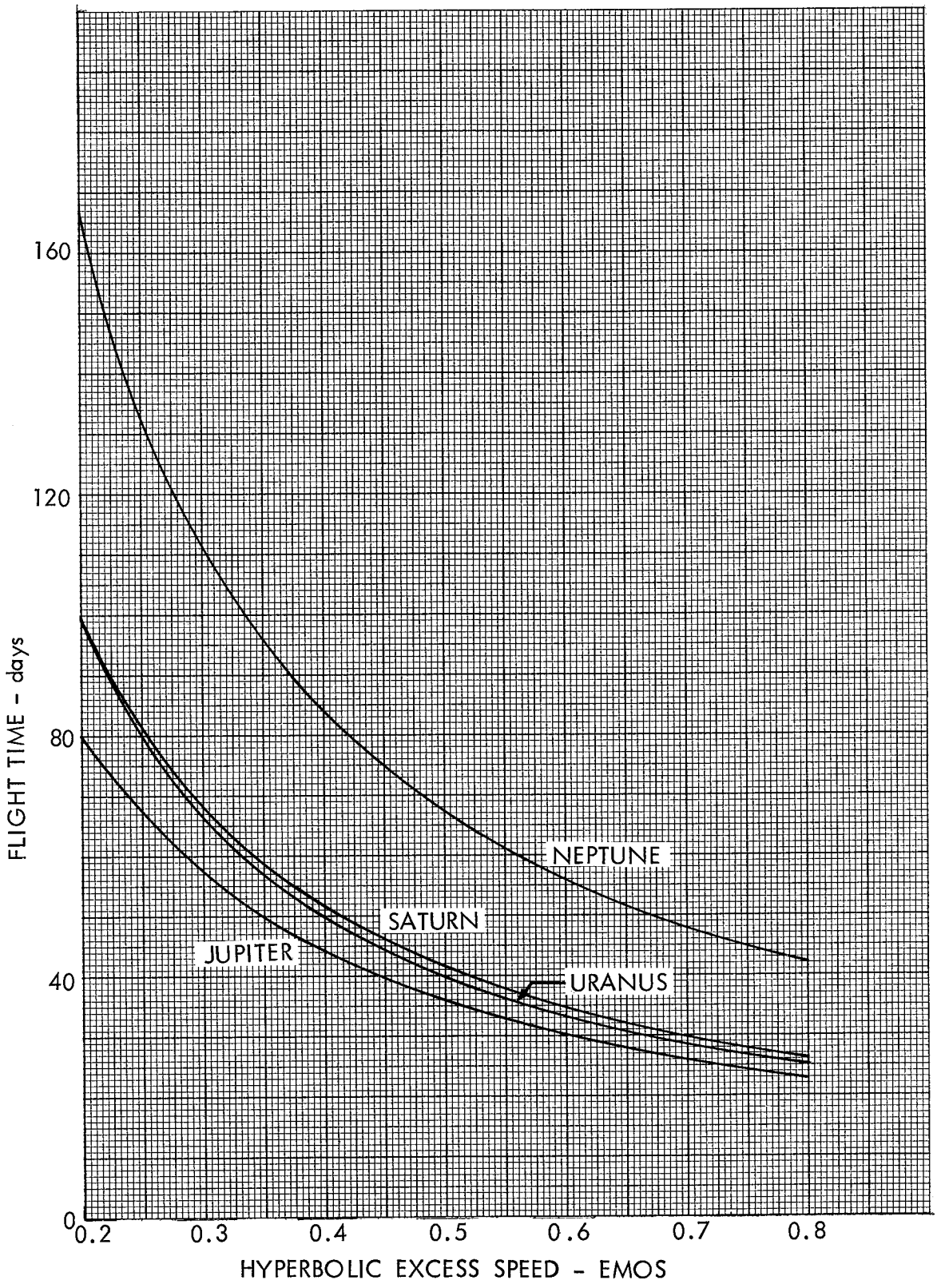

FIGURE 2-5 FLIGHT TIME FROM ACTIVITY SPHERE BOUNDARY TO PERIAPSIS

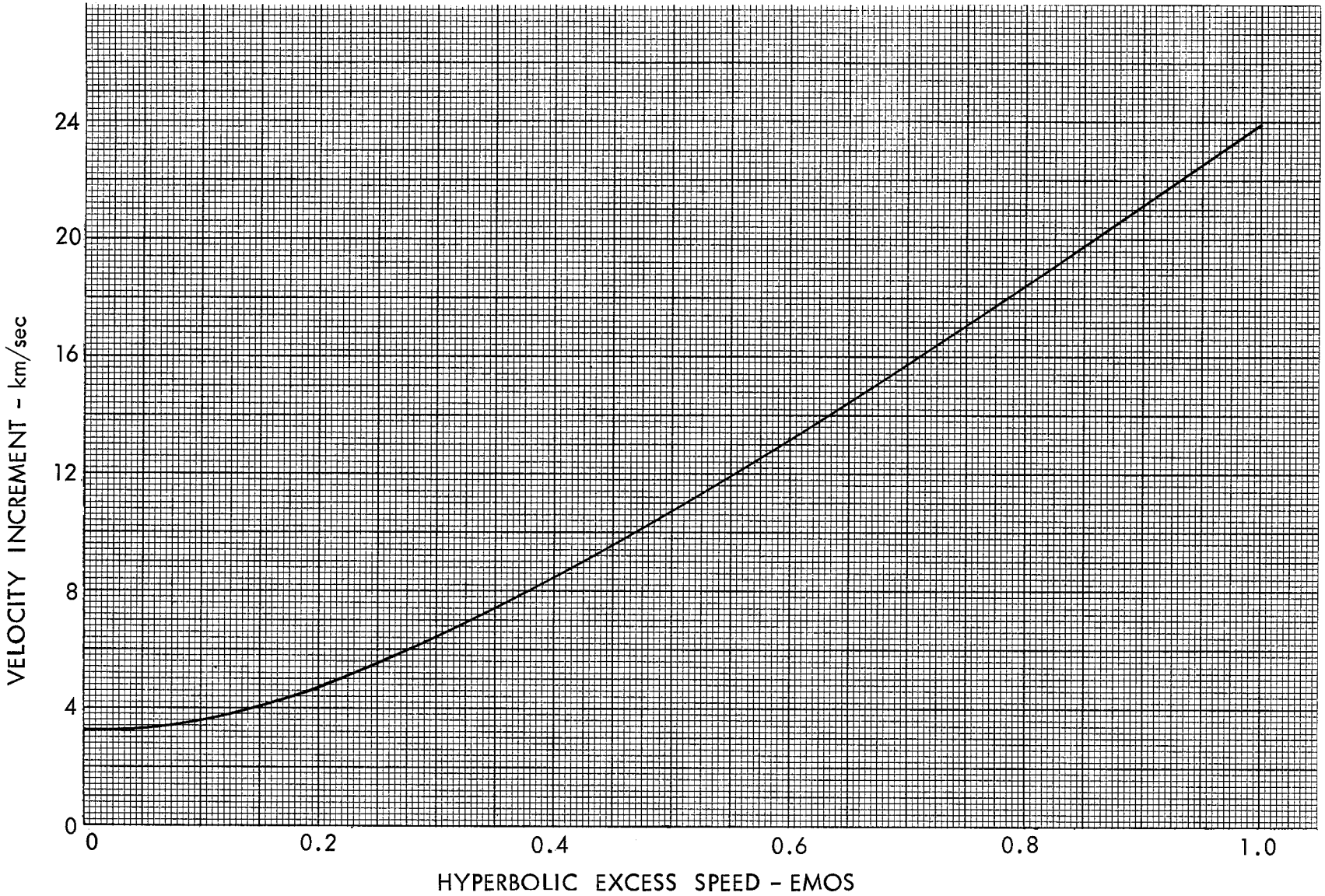

FIGURE 2-6 VELOCITY INCREMENT REQUIRED TO DEPART 185-km CIRCULAR EARTH ORBIT

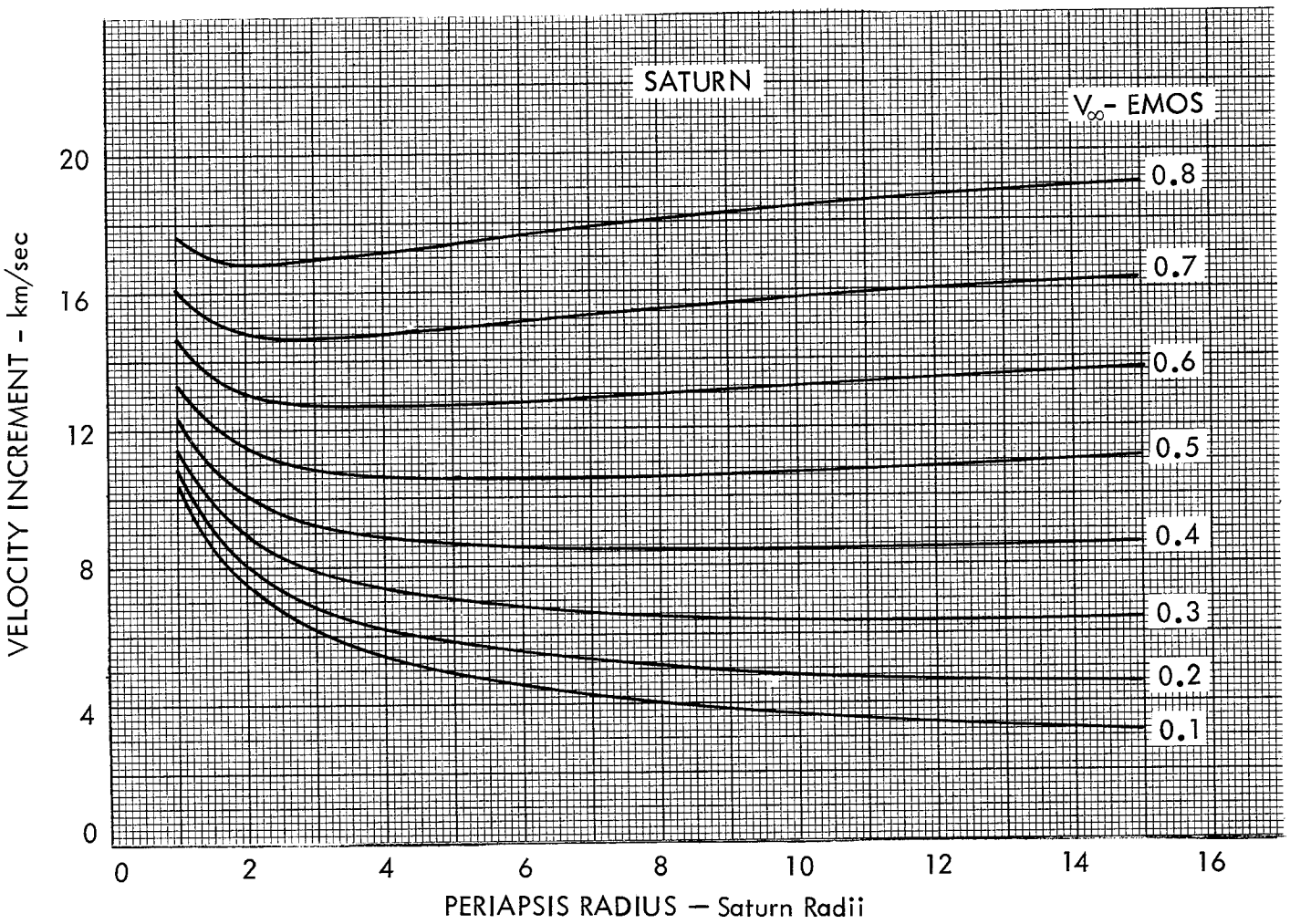

FIGURE 2-7 VELOCITY INCREMENTS REQUIRED TO ENTER CIRCULAR CAPTURE ORBITS—SATURN

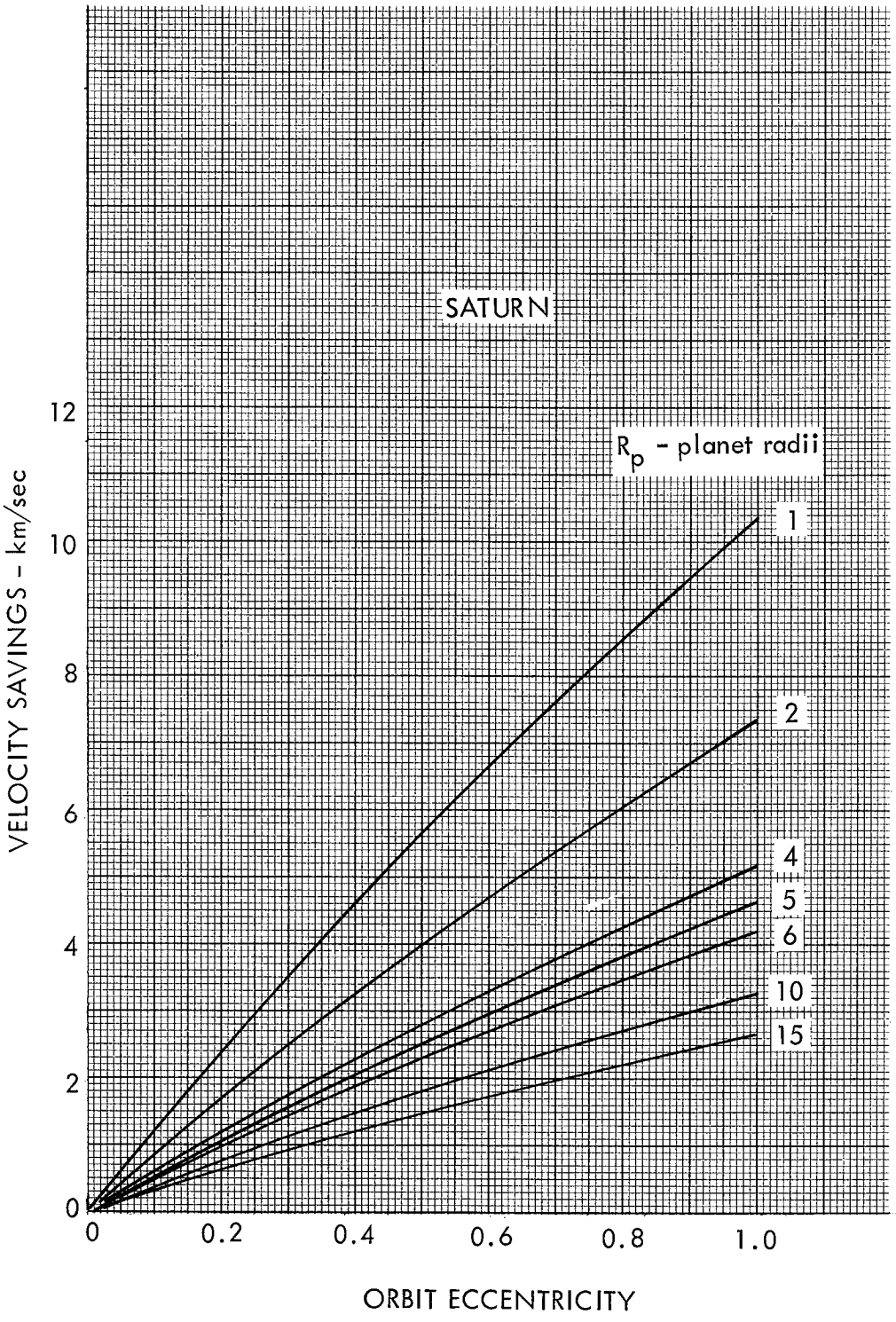

FIGURE 2-8 VELOCITY SAVINGS OBTAINED BY ENTERING ELLIPTIC ORBITS—SATURN

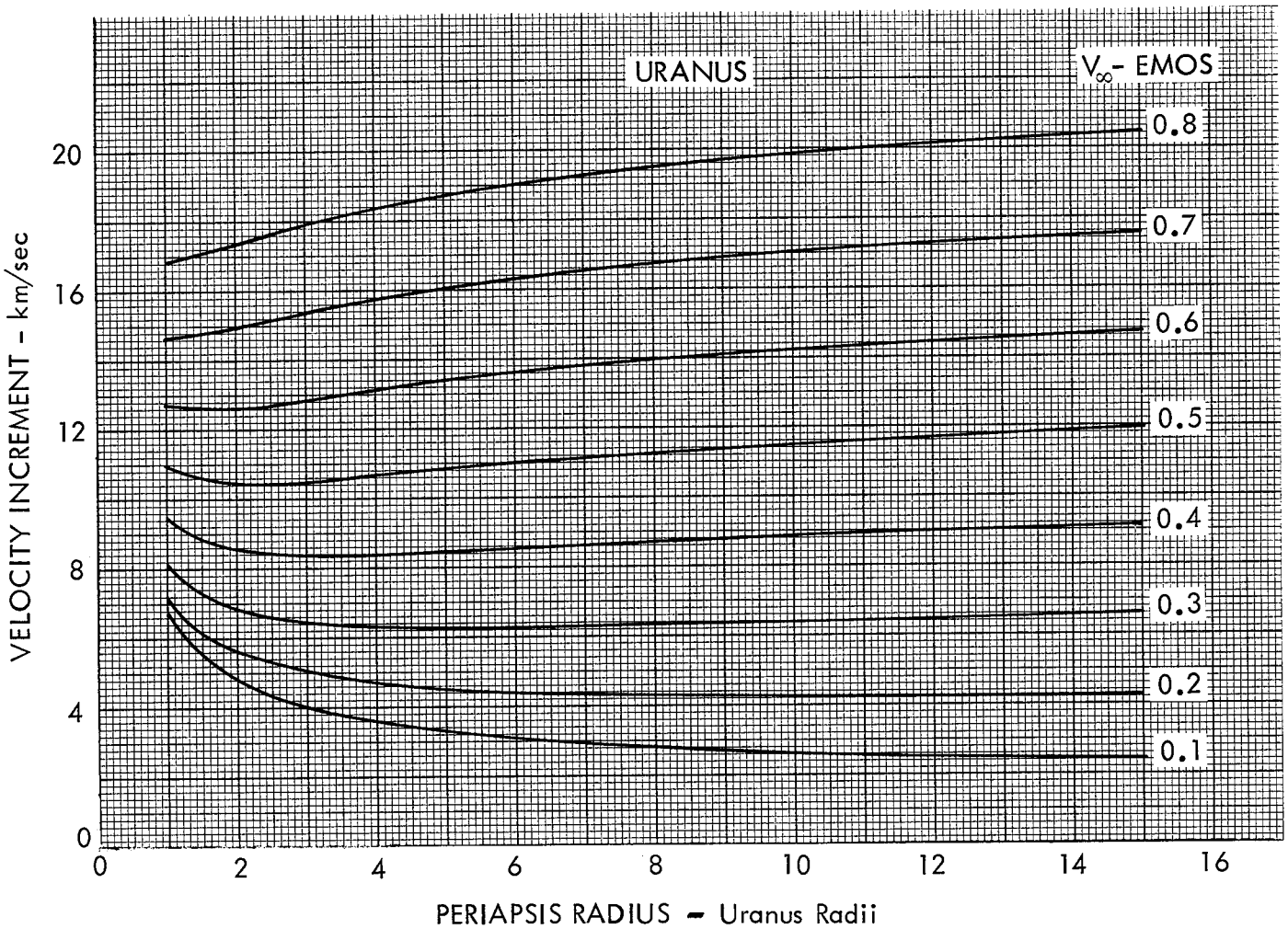

FIGURE 2-9 VELOCITY INCREMENTS REQUIRED TO ENTER CIRCULAR CAPTURE ORBITS–URANUS

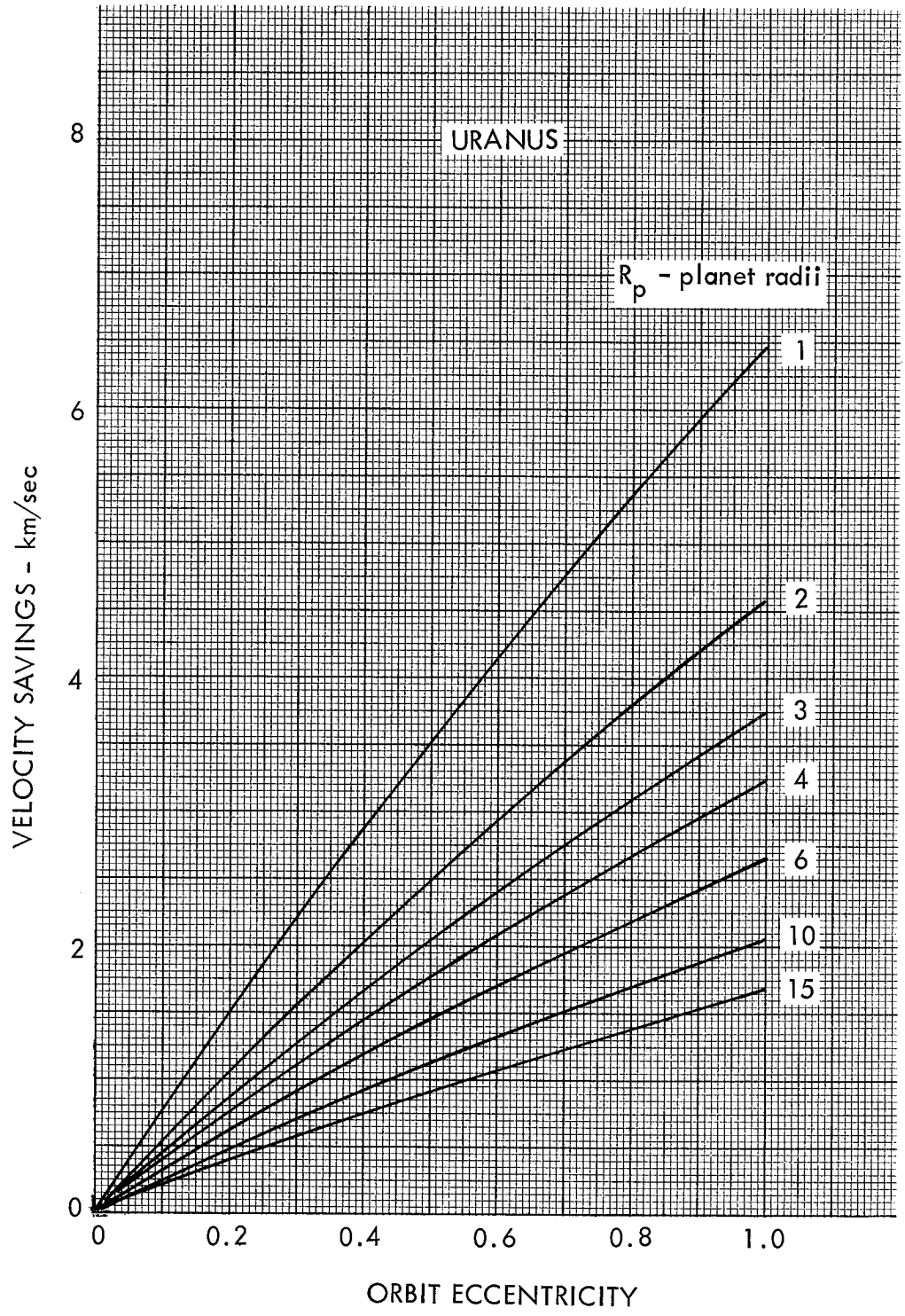

FIGURE 2-10 VELOCITY SAVINGS OBTAINED BY ENTERING ELLIPTIC ORBITS—URANUS

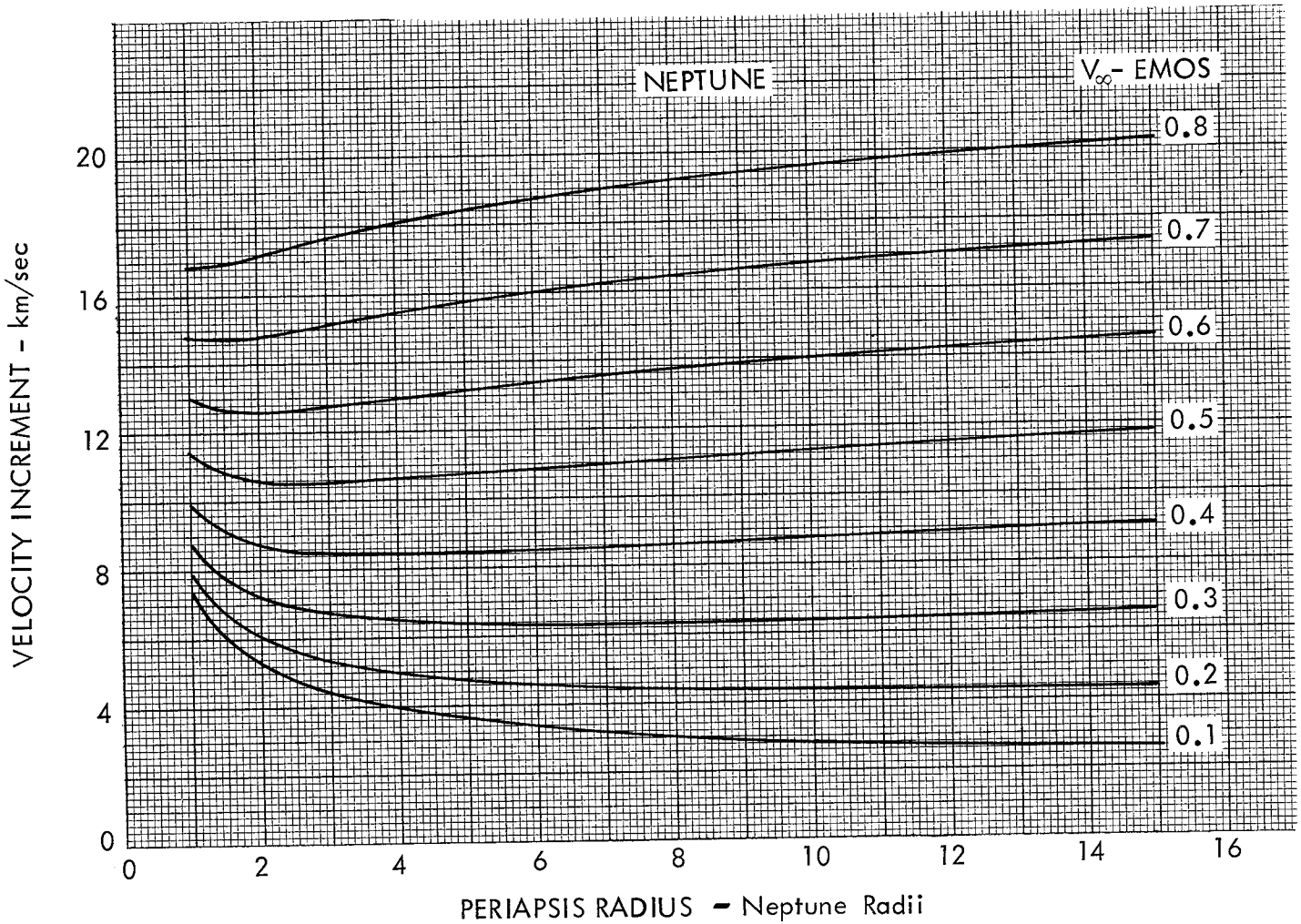

FIGURE 2-11 VELOCITY INCREMENTS REQUIRED TO ENTER CIRCULAR CAPTURE ORBITS - NEPTUNE

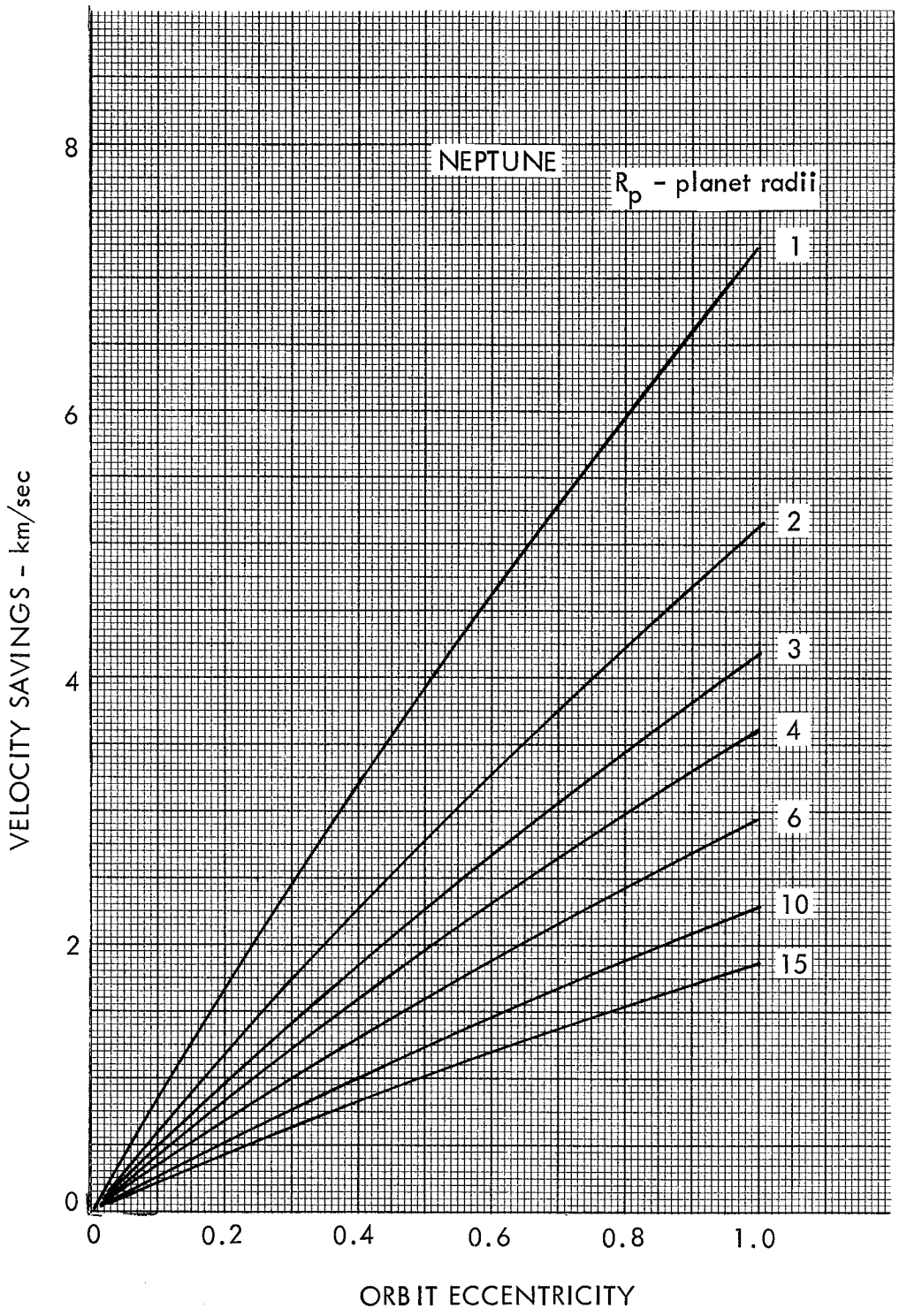

FIGURE 2-12 VELOCITY SAVINGS OBTAINED BY ENTERING ELLIPTIC ORBITS–NEPTUNE

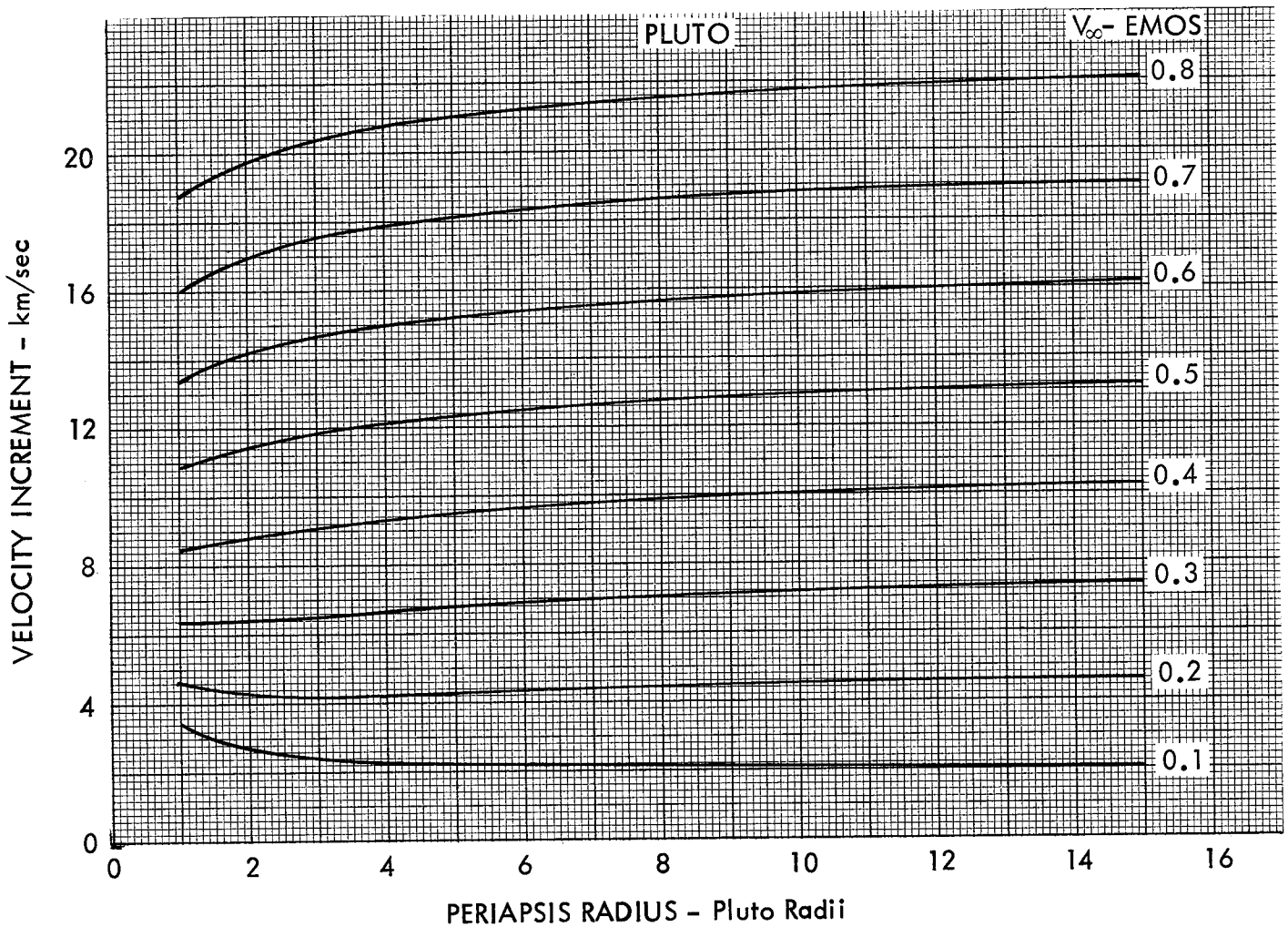

FIGURE 2-13 VELOCITY INCREMENTS REQUIRED TO ENTER CIRCULAR CAPTURE ORBITS - PLUTO

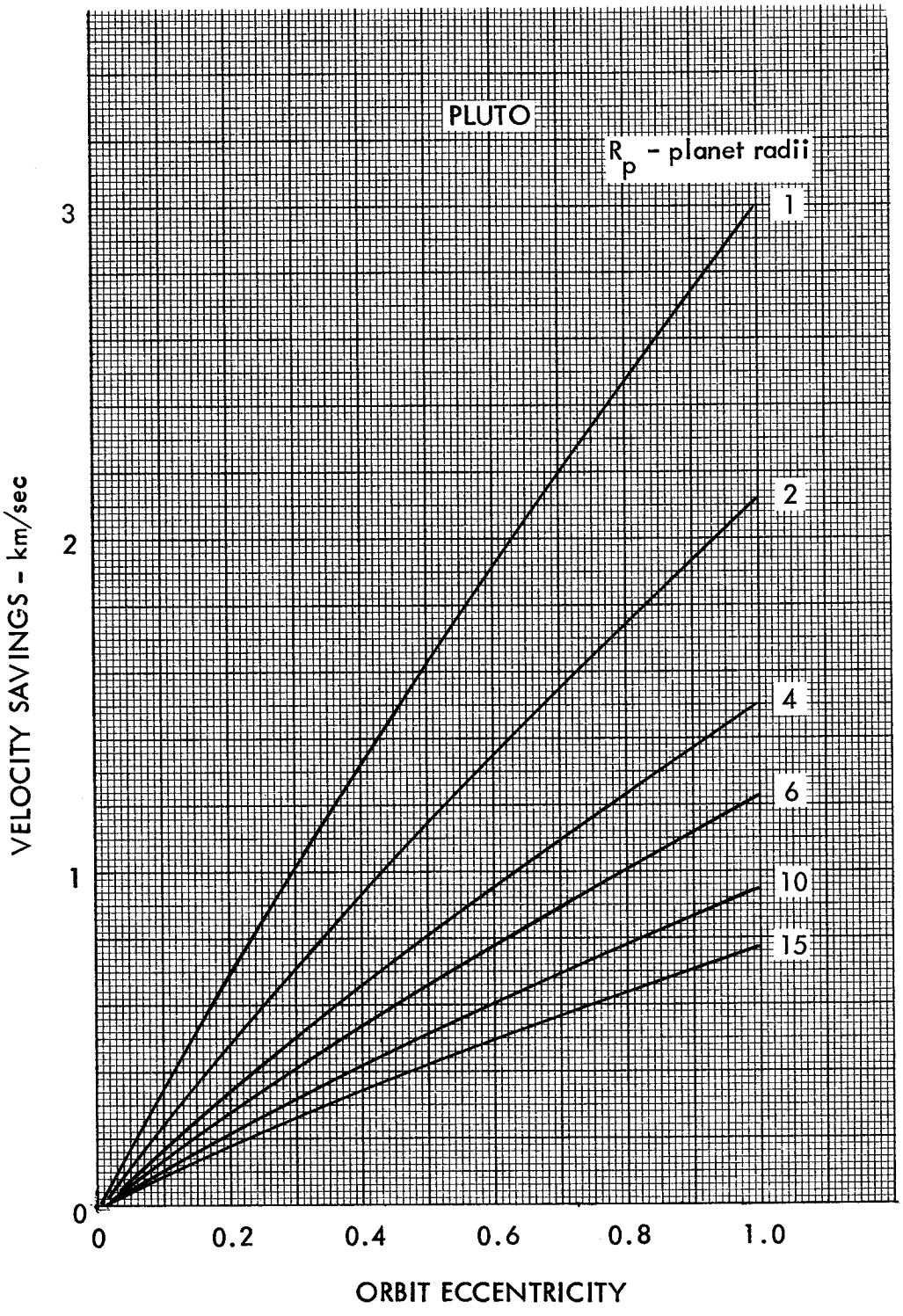

FIGURE 2-14 VELOCITY SAVINGS OBTAINED BY ENTERING ELLIPTIC ORBITS - PLUTO

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER DIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN DIST
40500.0	1969 OCT 5.5	1.00	11.9	0.0	191.0	-4.7	5.45	195.8	1.30	239.4	-2.6	6.45	9.23	34.7	-2.44	217.3	-16.9	8.32
40510.0	1969 OCT 15.5	1.00	21.8	0.0	200.2	-8.5	5.45	196.6	1.30	240.2	-2.7	6.45	9.23	35.1	-2.44	217.7	-17.0	8.26
40520.0	1969 OCT 25.5	0.99	31.8	0.0	209.6	-12.1	5.45	197.3	1.29	240.9	-2.7	6.42	9.23	35.4	-2.43	218.0	-17.1	8.24
40530.0	1969 NOV 4.5	0.99	41.8	0.0	219.3	-15.4	5.45	198.1	1.29	241.7	-2.7	6.37	9.23	35.8	-2.43	218.4	-17.2	8.24
40540.0	1969 NOV 14.5	0.99	51.8	0.0	229.4	-18.2	5.45	198.9	1.29	242.4	-2.7	6.31	9.22	36.1	-2.43	218.7	-17.4	8.28
40550.0	1969 NOV 24.5	0.99	61.9	0.0	239.8	-20.6	5.45	199.6	1.29	243.2	-2.7	6.22	9.22	36.5	-2.42	219.1	-17.5	8.34
40560.0	1969 DEC 4.5	0.99	72.0	0.0	250.5	-22.2	5.45	200.4	1.28	244.0	-2.8	6.11	9.22	36.8	-2.42	219.4	-17.6	8.43
40570.0	1969 DEC 14.5	0.98	82.2	0.0	261.5	-23.2	5.45	201.1	1.28	244.7	-2.8	5.99	9.22	37.2	-2.42	219.8	-17.7	8.55
40580.0	1969 DEC 24.5	0.98	92.4	0.0	272.6	-23.4	5.45	201.9	1.28	245.5	-2.8	5.85	9.21	37.6	-2.41	220.1	-17.8	8.68
40590.0	1970 JAN 3.5	0.98	102.6	0.0	283.7	-22.9	5.45	202.6	1.27	246.2	-2.8	5.71	9.21	37.9	-2.41	220.5	-18.0	8.83
40600.0	1970 JAN 13.5	0.98	112.8	0.0	294.6	-21.5	5.45	203.4	1.27	247.0	-2.8	5.55	9.21	38.3	-2.41	220.8	-18.1	9.00
40610.0	1970 JAN 23.5	0.98	122.9	0.0	305.3	-19.5	5.45	204.1	1.27	247.7	-2.8	5.39	9.21	38.6	-2.40	221.2	-18.2	9.16
40620.0	1970 FEB 2.5	0.99	133.1	0.0	315.4	-16.9	5.45	204.9	1.26	248.5	-2.9	5.23	9.20	39.0	-2.40	221.5	-18.3	9.33
40630.0	1970 FEB 12.5	0.99	143.2	0.0	325.6	-13.8	5.45	205.7	1.26	249.3	-2.9	5.07	9.20	39.4	-2.39	221.9	-18.5	9.49
40640.0	1970 FEB 22.5	0.99	153.3	0.0	335.3	-10.3	5.45	206.4	1.25	250.0	-2.9	4.92	9.20	39.7	-2.39	222.2	-18.6	9.64
40650.0	1970 MAR 4.5	0.99	163.4	0.0	344.7	-6.5	5.45	207.2	1.25	250.8	-2.9	4.78	9.20	40.1	-2.38	222.6	-18.7	9.77
40660.0	1970 MAR 14.5	0.99	173.4	0.0	353.9	-2.6	5.45	207.9	1.24	251.5	-2.9	4.66	9.19	40.4	-2.38	223.0	-18.8	9.90
40670.0	1970 MAR 24.5	1.00	183.3	0.0	3.0	1.3	5.45	208.7	1.24	252.3	-2.9	4.56	9.19	40.8	-2.37	223.3	-18.9	10.00
40680.0	1970 APR 3.5	1.00	193.2	0.0	12.1	5.2	5.44	209.4	1.23	253.0	-2.9	4.49	9.19	41.2	-2.37	223.7	-19.0	10.08
40690.0	1970 APR 13.5	1.00	203.0	0.0	21.3	9.0	5.44	210.2	1.23	253.8	-2.9	4.45	9.19	41.5	-2.37	224.0	-19.2	10.14
40700.0	1970 APR 23.5	1.01	212.8	0.0	30.6	12.4	5.44	211.0	1.22	254.6	-3.0	4.44	9.18	41.9	-2.36	224.4	-19.3	10.18
40710.0	1970 MAY 3.5	1.01	222.5	0.0	40.1	15.5	5.44	211.7	1.21	255.3	-3.0	4.45	9.18	42.2	-2.36	224.8	-19.4	10.19
40720.0	1970 MAY 13.5	1.01	232.2	0.0	49.8	18.3	5.44	212.5	1.21	256.1	-3.0	4.50	9.18	42.6	-2.35	225.1	-19.5	10.18
40730.0	1970 MAY 23.5	1.01	241.8	0.0	59.7	20.5	5.44	213.2	1.20	256.8	-3.0	4.58	9.18	43.0	-2.35	225.5	-19.6	10.14
40740.0	1970 JUN 2.5	1.01	251.4	0.0	69.9	22.2	5.44	214.0	1.19	257.6	-3.0	4.67	9.17	43.3	-2.34	225.9	-19.7	10.08
40750.0	1970 JUN 12.5	1.02	261.0	0.0	80.2	23.1	5.44	214.8	1.19	258.4	-3.0	4.79	9.17	43.7	-2.33	226.2	-19.8	10.00
40760.0	1970 JUN 22.5	1.02	270.5	0.0	90.6	23.4	5.43	215.5	1.18	259.1	-3.0	4.92	9.17	44.0	-2.33	226.6	-20.0	9.90
40770.0	1970 JUL 2.5	1.02	280.0	0.0	100.9	23.1	5.43	216.3	1.17	259.9	-3.0	5.07	9.17	44.4	-2.32	227.0	-20.1	9.78
40780.0	1970 JUL 12.5	1.02	289.6	0.0	111.2	22.0	5.43	217.0	1.16	260.6	-3.0	5.22	9.16	44.8	-2.32	227.3	-20.2	9.64
40790.0	1970 JUL 22.5	1.02	299.1	0.0	121.3	20.3	5.43	217.8	1.16	261.4	-3.0	5.37	9.16	45.1	-2.31	227.7	-20.3	9.49
40800.0	1970 AUG 1.5	1.01	308.7	0.0	131.1	18.1	5.43	218.6	1.15	262.2	-3.0	5.53	9.16	45.5	-2.31	228.1	-20.4	9.33
40810.0	1970 AUG 11.5	1.01	318.3	0.0	140.7	15.4	5.43	219.3	1.14	262.9	-3.0	5.67	9.16	45.9	-2.30	228.4	-20.5	9.17
40820.0	1970 AUG 21.5	1.01	327.9	0.0	150.1	12.2	5.43	220.1	1.13	263.7	-3.0	5.82	9.16	46.2	-2.29	228.8	-20.6	9.01
40830.0	1970 SEP 0.5	1.01	337.5	0.0	159.2	8.7	5.42	220.9	1.12	264.5	-3.1	5.95	9.15	46.6	-2.29	229.2	-20.7	8.84
40840.0	1970 SEP 10.5	1.01	347.2	0.0	168.3	5.0	5.42	221.6	1.11	265.2	-3.1	6.06	9.15	46.9	-2.28	229.5	-20.8	8.69
40850.0	1970 SEP 20.5	1.00	357.0	0.0	177.2	1.2	5.42	222.4	1.10	266.0	-3.1	6.17	9.15	47.3	-2.27	229.9	-20.9	8.54
40860.0	1970 OCT 0.5	1.00	6.8	0.0	186.2	-2.7	5.42	223.2	1.09	266.8	-3.1	6.25	9.15	47.7	-2.27	230.3	-21.0	8.42
40870.0	1970 OCT 10.5	1.00	16.6	0.0	195.3	-6.5	5.42	223.9	1.08	267.5	-3.1	6.32	9.14	48.0	-2.26	230.7	-21.1	8.31
40880.0	1970 OCT 20.5	1.00	26.5	0.0	204.6	-10.2	5.42	224.7	1.07	268.3	-3.1	6.37	9.14	48.4	-2.26	231.0	-21.2	8.23
40890.0	1970 OCT 30.5	0.99	36.5	0.0	214.2	-13.7	5.41	225.4	1.06	269.1	-3.1	6.40	9.14	48.8	-2.25	231.4	-21.3	8.17
40900.0	1970 NOV 9.5	0.99	46.5	0.0	224.1	-16.8	5.41	226.2	1.05	269.8	-3.1	6.40	9.14	49.1	-2.24	231.8	-21.4	8.15
40910.0	1970 NOV 19.5	0.99	56.4	0.0	234.3	-19.4	5.41	227.0	1.04	270.6	-3.1	6.39	9.14	49.5	-2.23	232.2	-21.5	8.16
40920.0	1970 NOV 29.5	0.99	66.7	0.0	244.9	-21.4	5.41	227.8	1.03	271.4	-3.1	6.35	9.13	49.9	-2.23	232.5	-21.6	8.20
40930.0	1970 DEC 9.5	0.98	76.9	0.0	255.7	-22.8	5.41	228.5	1.02	272.1	-3.1	6.29	9.13	50.2	-2.22	232.9	-21.7	8.26
40940.0	1970 DEC 19.5	0.98	87.0	0.0	266.8	-23.4	5.40	229.3	1.01	272.9	-3.1	6.21	9.13	50.6	-2.21	233.3	-21.8	8.36
40950.0	1970 DEC 29.5	0.98	97.2	0.0	277.9	-23.3	5.40	230.1	1.00	273.7	-3.1	6.11	9.13	50.9	-2.21	233.7	-21.9	8.48
40960.0	1971 JAN 8.5	0.98	107.4	0.0	288.9	-22.3	5.40	230.8	0.99	274.5	-3.1	6.00	9.13	51.3	-2.20	234.0	-22.0	8.62
40970.0	1971 JAN 18.5	0.98	117.6	0.0	299.7	-20.5	5.40	231.6	0.98	275.2	-3.1	5.87	9.12	51.7	-2.19	234.4	-22.1	8.77
40980.0	1971 JAN 28.5	0.98	127.8	0.0	310.2	-18.3	5.39	232.4	0.97	276.0	-3.1	5.72	9.12	52.0	-2.18	234.8	-22.2	8.93
40990.0	1971 FEB 7.5	0.99	137.9	0.0	320.4	-15.5	5.39	233.1	0.95	276.8	-3.0	5.57	9.12	52.4	-2.18	235.2	-22.3	9.10
41000.0	1971 FEB 17.5	0.99	148.0	0.0	330.2	-12.2	5.39	233.9	0.94	277.5	-3.0	5.41	9.12	52.8	-2.17	235.6	-22.4	9.26
41010.0	1971 FEB 27.5	0.99	158.1	0.0	339.8	-8.5	5.39	234.7	0.93	278.3	-3.0	5.25	9.12	53.1	-2.16	236.0	-22.5	9.42
41020.0	1971 MAR 9.5	0.99	168.1	0.0	349.1	-4.7	5.39	235.5	0.92	279.1	-3.0	5.09	9.11	53.5	-2.15	236.3	-22.6	9.57
41030.0	1971 MAR 19.5	1.00	178.1	0.0	358.3	-0.8	5.38	236.2	0.90	279.9	-3.0	4.93	9.11	53.9	-2.14	236.7	-22.7	9.71
41040.0	1971 MAR 29.5	1.00	188.0	0.0	7.4	3.2	5.38	237.0	0.89	280.6	-3.0	4.79	9.11	54.2	-2.14	237.1	-22.8	9.83
41050.0	1971 APR 8.5	1.00	197.8	0.0	16.5	7.0	5.38	237.8	0.88	281.4	-3.0	4.65	9.11	54.6	-2.13	237.5	-22.9	9.93
41060.0	1971 APR 18.5	1.00	207.7	0.0	25.7	10.5	5.38	238.6	0.86	282.2	-3.0	4.54	9.11	55.0	-2.12	237.9	-22.9	10.01
41070.0	1971 APR 28.5	1.01	217.4	0.0	35.1	14.0	5.37	239.3	0.85	283.0	-3.0	4.45	9.10	55.3	-2.11	238.3	-23.0	10.07
41080.0	1971 MAY 8.5	1.01	227.1	0.0	44.6	17.0	5.37	240.1	0.84	283.8	-3.0	4.39	9.10	55.7	-2.10	238.7	-23.1	10.10
41090.0	1971 MAY 18.5	1.01	236.7	0.0	54.5	19.4	5.37	240.9	0.82	284.5	-3.0	4.36	9.10	56.1	-2.09	239.0	-23.2	10.11
41100.0	1971 MAY 28.5	1.01	246.4	0.0	64.5	21.4	5.36	241.7	0.81	285.3	-3.0	4.36	9.10	56.4	-2.09	239.4	-23.3	10.10
41110.0	1971 JUN 7.5	1.01	255.9	0.0	74.7	22.7	5.36	242.5	0.80	286.1	-2.9	4.38	9.10	56.8	-2.08	239.8	-23.4	10.06
41120.0	1971 JUN 17.5	1.02	265.5	0.0	85.1	23.4	5.36	243.2	0.78	286.9	-2.9	4.44	9.09	57.2	-2.07	240.2	-23.4	10.00
41130.0	1971 JUN 27.5	1.02	275.0	0.0	95.5	23.4	5.36	244.0	0.77	287.7	-2.9	4.52	9.09	57.5	-2.06	240.6	-23.5	9.92
41140.0	1971 JUL 7.5	1.02	284.6	0.0	105.8	22.7	5.35	244.8	0.75	288.5	-2.9	4.62	9.09	57.9	-2.05	241.0	-23.6	9.82
41150.0	1971 JUL 17.5	1.02	294.1	0.0	116.0	21.3	5.35	245.6	0.74	289.2	-2.9	4.74	9.09	58.3	-2.04	241.4	-23.7	9.70
41160.0	1971 JUL 27.5	1.02	303.6	0.0	126.0	19.3	5.35	246.4	0.72	290.0	-2.9	4.87	9.09	58.6	-2.03	241.8	-23.8	9.56
41170.0	1971 AUG 6.5	1.01	313.2	0.0	135.7	16.9	5.34	247.2	0.71	290.8	-2.9	5.02	9.09	59.0	-2.02	242.2	-23.8	9.41
41180.0	1971 AUG 16.5	1.01	322.8	0.0	145.2	13.9	5.34	248.0	0.69	291.6	-2.9	5.17	9.08	59.4	-2.01	242.6	-23.9	9.26
41190.0	1971 AUG 26.5	1.01	332.4	0.0	154.4	10.6	5.34	248.7	0.68	292.4	-2.8	5.32	9.08	59.8	-2.00	243.0	-24.0	9.09
41200.0	1971 SEP 5.5	1.01	342.1	0.0	163.5	7.0	5.34	249.5	0.66	293.2	-2.8	5.47	9.08	60.1	-1.99	243.4	-24.1	8.93
41210.0	1971 SEP 15.5	1.01	351.8	0.0	172.5	3.2	5.33	250.3	0.65	294.0	-2.8	5.62	9.08	60.5	-1.98	243.8	-24.1	8.76
41220.0	1971 SEP 25.5	1.00	1.6	0.0	181.5	-0.6	5.33	251.1	0.63	294.8	-2.8	5.76	9.08	60.9	-1.97	244.2	-24.2	8.61
41230.0	1971 OCT 5.5	1.00	11.4	0.0	190.5	-4.5	5.33	251.9	0.62	295.6	-2.8	5.88	9.08	61.2	-1.96	244.5	-24.3	8.47
41240.0	1971 OCT 15.5	1.00	21.3	0.0	199.7	-8.3	5.32	252.7	0.60	296.3	-2.7	6.00	9.07	61.6	-1.95	244.9	-24.4	8.34
41250.0	1971 OCT 25.5	0.99	31.3	0.0	209.1	-11.9	5.32	253.5	0.58	297.1	-2.7	6.09	9.07	62.0	-1.94	245.3	-24.4	8.23
41260.0	1971 NOV 4.5	0.99	41.3	0.0	218.8	-15.2	5.32	254.3	0.57	297.9	-2.7	6.17	9.07	62.3	-1.93	245.7	-24.5	8.15
41270.0	1971 NOV 14.5	0.99	51.3	0.0	228.9	-18.1	5.31	255.1	0.55	298.7	-2.7	6.23	9.07	62.7	-1.92	246.1	-24.6	8.10
41280.0	1971 NOV 24.5	0.99	61.4	0.0	239.3	-20.5	5.31	255.9	0.53	299.5	-2.7	6.27	9.07	63.1	-1.91	246.5	-24.6	8.08
41290.0	1971 DEC 4.5	0.99	71.5	0.0	250.0	-22.2	5.31	256.7	0.52	300.3	-2.6	6.29	9.07	63.4	-1.90	246.9	-24.7	8.09
41300.0	1971 DEC 14.5	0.98	81.7	0.0	261.0	-23.2	5.30	257.5	0.50	301.1	-2.6	6.29	9.07	63.8	-1.89	247.3	-24.8	8.13
41310.0	1971 DEC 24.5	0.98	91.9	0.0	272.0	-23.4	5.30	258.3	0.48	301.9	-2.6	6.26	9.06	64.2	-1.88	247.7	-24.8	8.21
41320.0	1972 JAN 3.5	0.98	102.0	0.0	283.1	-22.9	5.30	259.1	0.47	302.7	-2.6	6.21	9.06	64.6	-1.87	248.1	-24.9	8.30
41330.0	1972 JAN 13.5	0.98	112.2	0.0	294.0	-21.6	5.29	259.9	0.45	303.5	-2.6	6.15	9.06	64.9	-1.86	248.5	-24.9	8.43
41340.0	1972 JAN 23.5	0.98	122.4	0.0	304.7	-19.6	5.29	260.7	0.43	304.3	-2.5	6.06	9.06	65.3	-1.85	249.0	-25.0	8.57

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	URANUS LONG	URANUS LAT	URANUS RAS	URANUS DECS	URANUS CDIST	NEPTUNE R	NEPTUNE LONG	NEPTUNE LAT	NEPTUNE RAS	NEPTUNE DECS	NEPTUNE CDIST	PLUTO R	PLUTO LONG	PLUTO LAT	PLUTO RAS	PLUTO DECS	PLUTO CDIST
40500.0	1969 OCT 5.5	18.30	184.4	0.72	357.4	18.0	19.29	30.31	238.0	1.70	224.5	-21.1	31.01	31.69	174.9	15.65	131.7	0.0	32.61
40510.0	1969 OCT 15.5	18.30	184.6	0.72	357.4	18.2	19.26	30.31	238.1	1.70	224.5	-21.1	31.12	31.68	175.0	15.65	131.8	0.0	32.54
40520.0	1969 OCT 25.5	18.30	184.7	0.72	357.4	18.3	19.19	30.31	238.2	1.70	224.6	-21.1	31.20	31.68	175.0	15.66	131.9	0.0	32.45
40530.0	1969 NOV 4.5	18.30	184.8	0.72	357.4	18.4	19.11	30.31	238.2	1.70	224.7	-21.1	31.26	31.67	175.1	15.67	131.9	0.0	32.34
40540.0	1969 NOV 14.5	18.30	184.9	0.72	357.3	18.5	18.99	30.31	238.3	1.70	224.7	-21.1	31.29	31.67	175.2	15.68	132.0	0.0	32.20
40550.0	1969 NOV 24.5	18.30	185.1	0.72	357.3	18.7	18.86	30.31	238.3	1.70	224.8	-21.2	31.29	31.66	175.2	15.68	132.0	0.0	32.05
40560.0	1969 DEC 4.5	18.31	185.2	0.72	357.3	18.8	18.71	30.31	238.4	1.70	224.8	-21.2	31.27	31.66	175.3	15.69	132.1	0.0	31.89
40570.0	1969 DEC 14.5	18.31	185.3	0.72	357.3	18.9	18.55	30.31	238.4	1.70	224.9	-21.2	31.21	31.65	175.3	15.70	132.2	0.0	31.72
40580.0	1969 DEC 24.5	18.31	185.5	0.72	357.3	19.1	18.39	30.31	238.5	1.69	225.0	-21.2	31.13	31.65	175.4	15.71	132.2	0.0	31.55
40590.0	1970 JAN 3.5	18.31	185.6	0.72	357.2	19.2	18.21	30.31	238.6	1.69	225.0	-21.2	31.02	31.64	175.5	15.71	132.3	0.0	31.38
40600.0	1970 JAN 13.5	18.31	185.7	0.72	357.2	19.3	18.04	30.31	238.6	1.69	225.1	-21.3	30.89	31.64	175.5	15.72	132.3	0.0	31.22
40610.0	1970 JAN 23.5	18.31	185.8	0.72	357.2	19.4	17.88	30.31	238.7	1.69	225.1	-21.3	30.75	31.63	175.6	15.73	132.4	0.0	31.07
40620.0	1970 FEB 2.5	18.31	186.0	0.72	357.2	19.6	17.73	30.31	238.7	1.69	225.2	-21.3	30.59	31.63	175.7	15.74	132.5	0.0	30.94
40630.0	1970 FEB 12.5	18.31	186.1	0.72	357.2	19.7	17.60	30.31	238.8	1.69	225.2	-21.3	30.42	31.62	175.7	15.74	132.5	0.0	30.83
40640.0	1970 FEB 22.5	18.31	186.2	0.71	357.1	19.8	17.49	30.31	238.9	1.69	225.3	-21.3	30.25	31.62	175.8	15.75	132.6	0.0	30.74
40650.0	1970 MAR 4.5	18.31	186.4	0.71	357.1	20.0	17.40	30.31	238.9	1.69	225.4	-21.4	30.07	31.61	175.8	15.76	132.6	0.0	30.68
40660.0	1970 MAR 14.5	18.31	186.5	0.71	357.1	20.1	17.34	30.31	239.0	1.69	225.4	-21.4	29.91	31.61	175.9	15.76	132.7	0.0	30.65
40670.0	1970 MAR 24.5	18.31	186.6	0.71	357.1	20.2	17.32	30.31	239.0	1.69	225.5	-21.4	29.76	31.60	176.0	15.77	132.8	0.0	30.65
40680.0	1970 APR 3.5	18.31	186.7	0.71	357.1	20.3	17.32	30.31	239.1	1.69	225.5	-21.4	29.62	31.60	176.0	15.78	132.8	0.0	30.68
40690.0	1970 APR 13.5	18.31	186.9	0.71	357.0	20.5	17.35	30.31	239.2	1.69	225.6	-21.4	29.50	31.59	176.1	15.79	132.9	0.0	30.73
40700.0	1970 APR 23.5	18.31	187.0	0.71	357.0	20.6	17.41	30.31	239.2	1.69	225.7	-21.5	29.41	31.59	176.1	15.79	132.9	0.0	30.82
40710.0	1970 MAY 3.5	18.31	187.1	0.71	357.0	20.7	17.50	30.31	239.3	1.69	225.7	-21.5	29.34	31.58	176.2	15.80	133.0	0.0	30.92
40720.0	1970 MAY 13.5	18.31	187.3	0.71	357.0	20.8	17.61	30.31	239.3	1.69	225.8	-21.5	29.30	31.57	176.3	15.81	133.1	0.0	31.04
40730.0	1970 MAY 23.5	18.31	187.4	0.71	357.0	21.0	17.74	30.31	239.4	1.69	225.8	-21.5	29.30	31.57	176.3	15.81	133.1	0.0	31.18
40740.0	1970 JUN 2.5	18.31	187.5	0.71	356.9	21.1	17.89	30.31	239.4	1.69	225.9	-21.5	29.32	31.56	176.4	15.82	133.2	0.0	31.33
40750.0	1970 JUN 12.5	18.32	187.6	0.71	356.9	21.2	18.05	30.31	239.5	1.69	226.0	-21.6	29.36	31.56	176.5	15.83	133.2	0.0	31.48
40760.0	1970 JUN 22.5	18.32	187.8	0.71	356.9	21.4	18.21	30.31	239.6	1.68	226.0	-21.6	29.44	31.55	176.5	15.84	133.3	0.0	31.64
40770.0	1970 JUL 2.5	18.32	187.9	0.71	356.9	21.5	18.38	30.31	239.6	1.68	226.1	-21.6	29.54	31.55	176.6	15.84	133.4	0.0	31.79
40780.0	1970 JUL 12.5	18.32	188.0	0.70	356.9	21.6	18.55	30.31	239.7	1.68	226.1	-21.6	29.66	31.54	176.6	15.85	133.4	0.0	31.94
40790.0	1970 JUL 22.5	18.32	188.2	0.70	356.8	21.7	18.70	30.31	239.7	1.68	226.2	-21.6	29.80	31.54	176.7	15.86	133.5	0.0	32.07
40800.0	1970 AUG 1.5	18.32	188.3	0.70	356.8	21.9	18.85	30.31	239.8	1.68	226.3	-21.7	29.96	31.53	176.8	15.86	133.5	0.0	32.19
40810.0	1970 AUG 11.5	18.32	188.4	0.70	356.8	22.0	18.98	30.31	239.9	1.68	226.3	-21.7	30.12	31.53	176.8	15.87	133.6	0.0	32.33
40820.0	1970 AUG 21.5	18.32	188.5	0.70	356.8	22.1	19.10	30.31	239.9	1.68	226.4	-21.7	30.29	31.52	176.9	15.88	133.7	0.0	32.38
40830.0	1970 SEP 0.5	18.32	188.7	0.70	356.8	22.2	19.19	30.31	240.0	1.68	226.4	-21.7	30.45	31.52	177.0	15.88	133.7	0.0	32.44
40840.0	1970 SEP 10.5	18.32	188.8	0.70	356.7	22.4	19.26	30.31	240.0	1.68	226.5	-21.7	30.62	31.51	177.0	15.89	133.8	0.0	32.47
40850.0	1970 SEP 20.5	18.32	188.9	0.70	356.7	22.5	19.30	30.31	240.1	1.68	226.6	-21.8	30.77	31.51	177.1	15.90	133.8	0.0	32.47
40860.0	1970 OCT 0.5	18.32	189.1	0.70	356.7	22.6	19.32	30.31	240.2	1.68	226.6	-21.8	30.91	31.50	177.1	15.91	133.9	0.0	32.45
40870.0	1970 OCT 10.5	18.32	189.2	0.70	356.7	22.7	19.31	30.31	240.2	1.68	226.7	-21.8	31.04	31.50	177.2	15.91	134.0	0.0	32.41
40880.0	1970 OCT 20.5	18.32	189.3	0.70	356.7	22.9	19.28	30.31	240.3	1.68	226.7	-21.8	31.14	31.49	177.3	15.92	134.0	0.0	32.33
40890.0	1970 OCT 30.5	18.32	189.4	0.70	356.6	23.0	19.21	30.31	240.3	1.68	226.8	-21.8	31.22	31.49	177.3	15.93	134.1	0.0	32.23
40900.0	1970 NOV 9.5	18.32	189.6	0.70	356.6	23.1	19.12	30.31	240.4	1.68	226.9	-21.9	31.27	31.48	177.4	15.93	134.1	0.0	32.11
40910.0	1970 NOV 19.5	18.32	189.7	0.70	356.6	23.3	19.01	30.31	240.4	1.68	226.9	-21.9	31.29	31.48	177.5	15.94	134.2	0.0	31.98
40920.0	1970 NOV 29.5	18.33	189.8	0.69	356.6	23.4	18.88	30.30	240.5	1.68	227.0	-21.9	31.29	31.47	177.5	15.95	134.3	0.0	31.82
40930.0	1970 DEC 9.5	18.33	190.0	0.69	356.5	23.5	18.73	30.30	240.6	1.67	227.0	-21.9	31.25	31.47	177.6	15.95	134.3	0.0	31.66
40940.0	1970 DEC 19.5	18.33	190.1	0.69	356.5	23.6	18.57	30.30	240.6	1.67	227.1	-21.9	31.19	31.46	177.6	15.96	134.4	0.0	31.49
40950.0	1970 DEC 29.5	18.33	190.2	0.69	356.5	23.8	18.40	30.30	240.7	1.67	227.2	-22.0	31.10	31.46	177.7	15.97	134.4	0.0	31.32
40960.0	1971 JAN 8.5	18.33	190.3	0.69	356.5	23.9	18.23	30.30	240.7	1.67	227.2	-22.0	30.99	31.45	177.8	15.97	134.5	0.0	31.15
40970.0	1971 JAN 18.5	18.33	190.5	0.69	356.5	24.0	18.06	30.30	240.8	1.67	227.3	-22.0	30.85	31.45	177.8	15.98	134.6	0.0	30.99
40980.0	1971 JAN 28.5	18.33	190.6	0.69	356.4	24.1	17.90	30.30	240.9	1.67	227.3	-22.0	30.70	31.44	177.9	15.99	134.6	0.0	30.84
40990.0	1971 FEB 7.5	18.33	190.7	0.69	356.4	24.3	17.75	30.30	240.9	1.67	227.4	-22.0	30.54	31.44	178.0	15.99	134.7	0.0	30.72
41000.0	1971 FEB 17.5	18.33	190.9	0.69	356.4	24.4	17.62	30.30	241.0	1.67	227.5	-22.1	30.37	31.43	178.0	16.00	134.7	0.0	30.61
41010.0	1971 FEB 27.5	18.33	191.0	0.69	356.4	24.5	17.51	30.30	241.0	1.67	227.5	-22.1	30.20	31.43	178.1	16.01	134.8	0.0	30.54
41020.0	1971 MAR 9.5	18.33	191.1	0.69	356.4	24.7	17.42	30.30	241.1	1.67	227.6	-22.1	30.03	31.42	178.1	16.01	134.9	0.0	30.48
41030.0	1971 MAR 19.5	18.33	191.2	0.69	356.3	24.8	17.36	30.30	241.2	1.67	227.6	-22.1	29.87	31.42	178.2	16.02	134.9	0.0	30.46
41040.0	1971 MAR 29.5	18.33	191.4	0.69	356.3	24.9	17.34	30.30	241.2	1.67	227.7	-22.1	29.72	31.41	178.3	16.03	135.0	0.0	30.47
41050.0	1971 APR 8.5	18.33	191.5	0.68	356.3	25.0	17.34	30.30	241.3	1.67	227.8	-22.1	29.59	31.41	178.3	16.03	135.1	0.0	30.50
41060.0	1971 APR 18.5	18.33	191.6	0.68	356.3	25.2	17.37	30.30	241.3	1.67	227.8	-22.2	29.47	31.40	178.4	16.04	135.1	0.0	30.56
41070.0	1971 APR 28.5	18.34	191.8	0.68	356.2	25.3	17.43	30.30	241.4	1.67	227.9	-22.2	29.39	31.40	178.5	16.05	135.2	0.0	30.65
41080.0	1971 MAY 8.5	18.34	191.9	0.68	356.2	25.4	17.52	30.30	241.4	1.67	227.9	-22.2	29.33	31.39	178.5	16.05	135.2	0.0	30.76
41090.0	1971 MAY 18.5	18.34	192.0	0.68	356.2	25.5	17.63	30.30	241.5	1.67	228.0	-22.2	29.30	31.39	178.6	16.06	135.3	0.0	30.89
41100.0	1971 MAY 28.5	18.34	192.1	0.68	356.2	25.7	17.76	30.30	241.6	1.66	228.1	-22.2	29.29	31.38	178.6	16.07	135.4	0.0	31.03
41110.0	1971 JUN 7.5	18.34	192.3	0.68	356.2	25.8	17.91	30.30	241.6	1.66	228.1	-22.3	29.32	31.38	178.7	16.07	135.4	0.0	31.18
41120.0	1971 JUN 17.5	18.34	192.4	0.68	356.1	25.9	18.07	30.30	241.7	1.66	228.2	-22.3	29.38	31.37	178.8	16.08	135.5	0.0	31.33
41130.0	1971 JUN 27.5	18.34	192.5	0.68	356.1	26.0	18.23	30.30	241.7	1.66	228.2	-22.3	29.46	31.37	178.8	16.09	135.5	0.0	31.49
41140.0	1971 JUL 7.5	18.34	192.7	0.68	356.1	26.2	18.40	30.30	241.8	1.66	228.3	-22.3	29.57	31.36	178.9	16.09	135.6	0.0	31.64
41150.0	1971 JUL 17.5	18.34	192.8	0.68	356.1	26.3	18.57	30.30	241.9	1.66	228.4	-22.3	29.69	31.36	179.0	16.10	135.7	0.0	31.79
41160.0	1971 JUL 27.5	18.34	192.9	0.68	356.1	26.4	18.73	30.30	241.9	1.66	228.4	-22.4	29.84	31.35	179.0	16.10	135.7	0.0	31.92
41170.0	1971 AUG 6.5	18.34	193.0	0.67	356.0	26.6	18.87	30.30	242.0	1.66	228.5	-22.4	29.99	31.35	179.1	16.11	135.8	0.0	32.03
41180.0	1971 AUG 16.5	18.34	193.2	0.67	356.0	26.7	19.00	30.30	242.0	1.66	228.5	-22.4	30.16	31.34	179.2	16.12	135.8	0.0	32.13
41190.0	1971 AUG 26.5	18.34	193.3	0.67	356.0	26.8	19.12	30.30	242.1	1.66	228.6	-22.4	30.33	31.34	179.2	16.12	135.9	0.0	32.21
41200.0	1971 SEP 5.5	18.34	193.4	0.67	356.0	26.9	19.21	30.30	242.2	1.66	228.7	-22.4	30.49	31.33	179.3	16.13	136.0	0.0	32.26
41210.0	1971 SEP 15.5	18.35	193.6	0.67	355.9	27.1	19.28	30.30	242.2	1.66	228.7	-22.4	30.65	31.33	179.3	16.14	136.0	0.0	32.29
41220.0	1971 SEP 25.5	18.35	193.7	0.67	355.9	27.2	19.33	30.30	242.3	1.66	228.8	-22.5	30.81	31.32	179.4	16.14	136.1	0.0	32.29
41230.0	1971 OCT 5.5	18.35	193.8	0.67	355.9	27.3	19.35	30.30	242.3	1.66	228.8	-22.5	30.94	31.32	179.5	16.15	136.1	0.0	32.26
41240.0	1971 OCT 15.5	18.35	193.9	0.67	355.9	27.4	19.34	30.30	242.4	1.66	228.9	-22.5	31.06	31.31	179.5	16.16	136.2	0.0	32.21
41250.0	1971 OCT 25.5	18.35	194.1	0.67	355.9	27.6	19.30	30.30	242.4	1.65	229.0	-22.5	31.16	31.31	179.6	16.16	136.3	0.0	32.13
41260.0	1971 NOV 4.5	18.35	194.2	0.67	355.8	27.7	19.24	30.30	242.5	1.65	229.0	-22.5	31.23	31.30	179.7	16.17	136.3	0.0	32.02
41270.0	1971 NOV 14.5	18.35	194.3	0.67	355.8	27.8	19.15	30.30	242.6	1.65	229.1	-22.6	31.27	31.30	179.7	16.17	136.4	0.0	31.90
41280.0	1971 NOV 24.5	18.35	194.5	0.67	355.8	27.9	19.04	30.30	242.6	1.65	229.1	-22.6	31.29	31.29	179.8	16.18	136.5	0.0	31.76
41290.0	1971 DEC 4.5	18.35	194.6	0.66	355.8	28.1	18.91	30.30	242.7	1.65	229.2	-22.6	31.28	31.29	179.8	16.19	136.5	0.0	31.60
41300.0	1971 DEC 14.5	18.35	194.7	0.66	355.7	28.2	18.76	30.30	242.7	1.65	229.3	-22.6	31.23	31.28	179.9	16.19	136.6	0.0	31.43
41310.0	1971 DEC 24.5	18.35	194.8	0.66	355.7	28.3	18.60	30.30	242.8	1.65	229.3	-22.6	31.16	31.28	180.0	16.20	136.6	0.0	31.26
41320.0	1972 JAN 3.5	18.35	195.0	0.66	355.7	28.5	18.43	30.30	242.9	1.65	229.4	-22.7	31.07	31.27	180.0	16.21	136.7	0.0	31.09
41330.0	1972 JAN 13.5	18.35	195.1	0.66	355.7	28.6	18.26	30.30	242.9	1.65	229.4	-22.7	30.95	31.27	180.1	16.21	136.8	0.0	30.93
41340.0	1972 JAN 23.5	18.36	195.2	0.66	355.7	28.7	18.09	30.30	243.0	1.65	229.5	-22.7	30.81	31.26	180.2	16.22	136.8	0.0	30.77

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
41350.0	1972 FEB 2.5	0.99	132.6	0.0	315.1	-17.0	5.29	261.5	0.42	305.1	-2.5	5.96	9.06	65.7	-1.84	249.4	-25.1	8.72
41360.0	1972 FEB 12.5	0.99	142.7	0.0	325.1	-13.9	5.28	262.3	0.40	305.9	-2.5	5.83	9.06	66.0	-1.83	249.8	-25.1	8.88
41370.0	1972 FEB 22.5	0.99	152.8	0.0	334.8	-10.5	5.28	263.1	0.38	306.7	-2.5	5.70	9.06	66.4	-1.82	250.2	-25.2	9.05
41380.0	1972 MAR 3.5	0.99	162.9	0.0	344.2	-6.7	5.28	263.9	0.36	307.5	-2.4	5.55	9.05	66.8	-1.81	250.6	-25.2	9.21
41390.0	1972 MAR 13.5	0.99	172.8	0.0	353.4	-2.8	5.27	264.7	0.35	308.4	-2.4	5.40	9.05	67.1	-1.80	251.0	-25.3	9.37
41400.0	1972 MAR 23.5	1.00	182.8	0.0	2.6	1.1	5.27	265.5	0.33	309.2	-2.4	5.24	9.05	67.5	-1.79	251.4	-25.3	9.52
41410.0	1972 APR 2.5	1.00	192.7	0.0	11.7	5.0	5.27	266.3	0.31	310.0	-2.4	5.08	9.05	67.9	-1.77	251.8	-25.4	9.66
41420.0	1972 APR 12.5	1.00	202.5	0.0	20.8	8.8	5.26	267.1	0.29	310.8	-2.3	4.92	9.05	68.3	-1.76	252.2	-25.4	9.77
41430.0	1972 APR 22.5	1.01	212.3	0.0	30.1	12.3	5.26	267.9	0.27	311.6	-2.3	4.77	9.05	68.6	-1.75	252.6	-25.5	9.88
41440.0	1972 MAY 2.5	1.01	222.0	0.0	39.6	15.4	5.26	268.7	0.26	312.4	-2.3	4.62	9.05	69.0	-1.74	253.0	-25.5	9.95
41450.0	1972 MAY 12.5	1.01	231.7	0.0	49.3	18.2	5.25	269.6	0.24	313.2	-2.2	4.50	9.05	69.4	-1.73	253.4	-25.6	10.01
41460.0	1972 MAY 22.5	1.01	241.3	0.0	59.2	20.4	5.25	270.4	0.22	314.0	-2.2	4.39	9.04	69.7	-1.72	253.8	-25.6	10.05
41470.0	1972 JUN 1.5	1.01	250.9	0.0	69.3	22.1	5.25	271.2	0.20	314.9	-2.2	4.31	9.04	70.1	-1.70	254.2	-25.7	10.06
41480.0	1972 JUN 11.5	1.02	260.5	0.0	79.7	23.1	5.24	272.0	0.18	315.7	-2.1	4.25	9.04	70.5	-1.69	254.6	-25.7	10.04
41490.0	1972 JUN 21.5	1.02	270.0	0.0	90.0	23.4	5.24	272.8	0.16	316.5	-2.1	4.22	9.04	70.9	-1.68	255.1	-25.8	10.01
41500.0	1972 JUL 1.5	1.02	279.6	0.0	100.4	23.1	5.23	273.6	0.15	317.3	-2.1	4.22	9.04	71.2	-1.67	255.5	-25.8	9.95
41510.0	1972 JUL 11.5	1.02	289.1	0.0	110.7	22.1	5.23	274.5	0.13	318.1	-2.0	4.26	9.04	71.6	-1.66	255.9	-25.9	9.86
41520.0	1972 JUL 21.5	1.02	298.6	0.0	120.8	20.4	5.23	275.3	0.11	318.9	-2.0	4.31	9.04	72.0	-1.64	256.3	-25.9	9.76
41530.0	1972 AUG 0.5	1.01	308.2	0.0	130.6	18.2	5.22	276.1	0.09	319.8	-2.0	4.40	9.04	72.4	-1.63	256.7	-25.9	9.64
41540.0	1972 AUG 10.5	1.01	317.8	0.0	140.2	15.5	5.22	276.9	0.07	320.6	-1.9	4.50	9.04	72.7	-1.62	257.1	-26.0	9.51
41550.0	1972 AUG 20.5	1.01	327.4	0.0	149.6	12.4	5.22	277.8	0.05	321.4	-1.9	4.63	9.03	73.1	-1.61	257.5	-26.0	9.36
41560.0	1972 AUG 30.5	1.01	337.0	0.0	158.8	8.9	5.21	278.6	0.03	322.2	-1.9	4.76	9.03	73.5	-1.60	257.9	-25.9	9.20
41570.0	1972 SEP 9.5	1.01	346.7	0.0	167.8	5.2	5.21	279.4	0.01	323.1	-1.8	4.91	9.03	73.8	-1.58	258.3	-26.1	9.04
41580.0	1972 SEP 19.5	1.00	356.5	0.0	176.8	1.4	5.21	280.2	-0.00	323.9	-1.8	5.06	9.03	74.2	-1.57	258.8	-26.1	8.87
41590.0	1972 SEP 29.5	1.00	6.3	0.0	185.8	-2.5	5.20	281.1	-0.02	324.7	-1.8	5.21	9.03	74.6	-1.56	259.2	-26.1	8.71
41600.0	1972 OCT 9.5	1.00	16.1	0.0	194.9	-6.3	5.20	281.9	-0.04	325.6	-1.7	5.37	9.03	75.0	-1.55	259.6	-26.2	8.56
41610.0	1972 OCT 19.5	1.00	26.0	0.0	204.1	-10.1	5.19	282.7	-0.06	326.4	-1.7	5.51	9.03	75.3	-1.53	260.0	-26.2	8.41
41620.0	1972 OCT 29.5	0.99	36.0	0.0	213.7	-13.5	5.19	283.6	-0.08	327.2	-1.7	5.65	9.03	75.7	-1.52	260.4	-26.2	8.29
41630.0	1972 NOV 8.5	0.99	46.0	0.0	223.6	-16.6	5.19	284.4	-0.10	328.1	-1.6	5.77	9.03	76.1	-1.51	260.8	-26.3	8.18
41640.0	1972 NOV 18.5	0.99	56.1	0.0	233.8	-19.3	5.18	285.2	-0.12	328.9	-1.6	5.88	9.03	76.5	-1.49	261.2	-26.3	8.11
41650.0	1972 NOV 28.5	0.99	66.2	0.0	244.3	-21.4	5.18	286.1	-0.14	329.7	-1.5	5.97	9.02	76.8	-1.48	261.7	-26.3	8.06
41660.0	1972 DEC 8.5	0.98	76.3	0.0	255.2	-22.7	5.18	286.9	-0.16	330.6	-1.5	6.05	9.02	77.2	-1.47	262.1	-26.3	8.04
41670.0	1972 DEC 18.5	0.98	86.5	0.0	266.2	-23.4	5.17	287.7	-0.17	331.4	-1.5	6.10	9.02	77.6	-1.45	262.5	-26.4	8.05
41680.0	1972 DEC 28.5	0.98	96.7	0.0	277.3	-23.3	5.17	288.6	-0.19	332.2	-1.4	6.13	9.02	77.9	-1.44	262.9	-26.4	8.10
41690.0	1973 JAN 7.5	0.98	106.9	0.0	288.3	-22.4	5.17	289.4	-0.21	333.1	-1.4	6.15	9.02	78.3	-1.43	263.3	-26.4	8.17
41700.0	1973 JAN 17.5	0.98	117.1	0.0	299.1	-20.8	5.16	290.3	-0.23	333.9	-1.3	6.14	9.02	78.7	-1.42	263.7	-26.4	8.27
41710.0	1973 JAN 27.5	0.98	127.2	0.0	309.7	-18.5	5.16	291.1	-0.25	334.8	-1.3	6.11	9.02	79.1	-1.40	264.2	-26.4	8.40
41720.0	1973 FEB 6.5	0.99	137.4	0.0	319.9	-15.6	5.15	292.0	-0.27	335.6	-1.3	6.06	9.02	79.4	-1.39	264.6	-26.5	8.54
41730.0	1973 FEB 16.5	0.99	147.5	0.0	329.7	-12.3	5.15	292.8	-0.29	336.5	-1.2	5.99	9.02	79.8	-1.37	265.0	-26.5	8.69
41740.0	1973 FEB 26.5	0.99	157.6	0.0	339.3	-8.7	5.15	293.7	-0.31	337.3	-1.2	5.90	9.02	80.2	-1.36	265.4	-26.5	8.86
41750.0	1973 MAR 8.5	0.99	167.6	0.0	348.6	-4.9	5.14	294.5	-0.33	338.2	-1.1	5.79	9.02	80.6	-1.35	265.8	-26.5	9.02
41760.0	1973 MAR 18.5	1.00	177.6	0.0	357.8	-1.0	5.14	295.3	-0.34	339.0	-1.1	5.67	9.02	80.9	-1.33	266.2	-26.5	9.19
41770.0	1973 MAR 28.5	1.00	187.5	0.0	6.9	3.0	5.14	296.2	-0.36	339.9	-1.1	5.54	9.02	81.3	-1.32	266.7	-26.5	9.34
41780.0	1973 APR 7.5	1.00	197.3	0.0	16.0	5.8	5.13	297.1	-0.38	340.7	-1.0	5.39	9.02	81.7	-1.31	267.1	-26.5	9.49
41790.0	1973 APR 17.5	1.00	207.1	0.0	25.2	10.5	5.13	297.9	-0.40	341.6	-1.0	5.24	9.02	82.1	-1.29	267.5	-26.5	9.63
41800.0	1973 APR 27.5	1.01	216.9	0.0	34.6	13.8	5.13	298.8	-0.42	342.4	-0.9	5.08	9.01	82.4	-1.28	267.9	-26.5	9.75
41810.0	1973 MAY 7.5	1.01	226.6	0.0	44.1	16.3	5.12	299.6	-0.44	343.3	-0.9	4.92	9.01	82.8	-1.26	268.3	-26.5	9.85
41820.0	1973 MAY 17.5	1.01	236.2	0.0	54.0	19.3	5.12	300.5	-0.46	344.1	-0.8	4.77	9.01	83.2	-1.25	268.8	-26.6	9.93
41830.0	1973 MAY 27.5	1.01	245.9	0.0	64.0	21.3	5.12	301.3	-0.47	345.0	-0.8	4.62	9.01	83.5	-1.24	269.2	-26.6	9.98
41840.0	1973 JUN 6.5	1.01	255.4	0.0	74.2	22.7	5.11	302.2	-0.49	345.8	-0.8	4.48	9.01	83.9	-1.22	269.6	-26.6	10.02
41850.0	1973 JUN 16.5	1.02	265.0	0.0	84.6	23.4	5.11	303.0	-0.51	346.7	-0.7	4.35	9.01	84.3	-1.21	270.0	-26.6	10.03
41860.0	1973 JUN 26.5	1.02	274.5	0.0	95.0	23.4	5.11	303.9	-0.53	347.6	-0.7	4.25	9.01	84.7	-1.19	270.4	-26.6	10.01
41870.0	1973 JUL 6.5	1.02	284.1	0.0	105.3	22.7	5.10	304.8	-0.55	348.4	-0.6	4.17	9.01	85.0	-1.18	270.8	-26.6	9.98
41880.0	1973 JUL 16.5	1.02	293.6	0.0	115.5	21.4	5.10	305.6	-0.56	349.3	-0.6	4.11	9.01	85.4	-1.17	271.3	-26.6	9.92
41890.0	1973 JUL 26.5	1.02	303.2	0.0	125.5	19.5	5.09	306.5	-0.58	350.1	-0.5	4.08	9.01	85.8	-1.15	271.7	-26.5	9.84
41900.0	1973 AUG 5.5	1.01	312.7	0.0	135.2	17.0	5.09	307.4	-0.60	351.0	-0.5	4.08	9.01	86.2	-1.14	272.1	-26.5	9.74
41910.0	1973 AUG 15.5	1.01	322.3	0.0	144.7	14.1	5.09	308.2	-0.62	351.9	-0.4	4.11	9.01	86.5	-1.12	272.5	-26.5	9.62
41920.0	1973 AUG 25.5	1.01	331.9	0.0	154.0	10.8	5.08	309.1	-0.63	352.7	-0.4	4.17	9.01	86.9	-1.11	272.9	-25.5	9.48
41930.0	1973 SEP 4.5	1.01	341.6	0.0	163.1	7.2	5.08	310.0	-0.65	353.6	-0.3	4.26	9.01	87.3	-1.09	273.4	-26.5	9.33
41940.0	1973 SEP 14.5	1.01	351.3	0.0	172.1	3.4	5.08	310.8	-0.67	354.5	-0.3	4.36	9.01	87.7	-1.08	273.8	-26.5	9.17
41950.0	1973 SEP 24.5	1.00	1.1	0.0	181.0	-0.4	5.08	311.7	-0.69	355.3	-0.2	4.49	9.01	88.0	-1.06	274.2	-26.5	9.01
41960.0	1973 OCT 4.5	1.00	10.9	0.0	190.1	-4.3	5.07	312.6	-0.70	356.2	-0.2	4.63	9.01	88.4	-1.05	274.6	-26.5	8.85
41970.0	1973 OCT 14.5	1.00	20.8	0.0	199.2	-8.1	5.07	313.5	-0.72	357.1	-0.2	4.77	9.01	88.8	-1.03	275.0	-26.5	8.68
41980.0	1973 OCT 24.5	0.99	30.7	0.0	208.6	-11.7	5.07	314.3	-0.74	358.0	-0.1	4.93	9.01	89.2	-1.02	275.4	-26.5	8.53
41990.0	1973 NOV 3.5	0.99	40.7	0.0	218.3	-15.1	5.06	315.2	-0.75	358.8	-0.1	5.08	9.01	89.5	-1.00	275.9	-26.4	8.39
42000.0	1973 NOV 13.5	0.99	50.8	0.0	228.4	-18.0	5.06	316.1	-0.77	359.7	-0.0	5.23	9.01	89.9	-0.99	276.3	-26.4	8.26
42010.0	1973 NOV 23.5	0.99	60.9	0.0	238.7	-20.3	5.05	317.0	-0.78	0.6	0.0	5.38	9.01	90.3	-0.97	276.7	-26.4	8.15
42020.0	1973 DEC 3.5	0.99	71.0	0.0	249.4	-22.1	5.05	317.8	-0.80	1.5	0.1	5.52	9.01	90.7	-0.96	277.1	-26.4	8.09
42030.0	1973 DEC 13.5	0.98	81.2	0.0	260.4	-23.2	5.05	318.7	-0.82	2.4	0.1	5.64	9.01	91.0	-0.94	277.5	-26.4	8.04
42040.0	1973 DEC 23.5	0.98	91.3	0.0	271.5	-23.4	5.05	319.6	-0.83	3.2	0.2	5.75	9.01	91.4	-0.93	278.0	-26.3	8.02
42050.0	1974 JAN 2.5	0.98	101.5	0.0	282.6	-22.9	5.04	320.5	-0.85	4.1	0.2	5.84	9.01	91.8	-0.91	278.4	-26.3	8.04
42060.0	1974 JAN 12.5	0.98	111.7	0.0	293.5	-21.7	5.04	321.4	-0.86	5.0	0.3	5.92	9.01	92.2	-0.90	278.9	-26.3	8.09
42070.0	1974 JAN 22.5	0.98	121.9	0.0	304.2	-19.7	5.04	322.3	-0.88	5.9	0.3	5.97	9.01	92.5	-0.88	279.2	-26.3	8.16
42080.0	1974 FEB 1.5	0.99	132.1	0.0	314.5	-17.2	5.04	323.1	-0.89	6.8	0.4	6.01	9.01	92.9	-0.87	279.6	-26.2	8.27
42090.0	1974 FEB 11.5	0.99	142.2	0.0	324.6	-14.1	5.03	324.0	-0.91	7.6	0.4	6.02	9.01	93.3	-0.85	280.0	-26.2	8.39
42100.0	1974 FEB 21.5	0.99	152.3	0.0	334.3	-10.7	5.03	324.9	-0.92	8.5	0.5	6.01	9.01	93.7	-0.84	280.5	-26.2	8.53
42110.0	1974 MAR 3.5	0.99	162.3	0.0	343.7	-6.9	5.03	325.8	-0.94	9.4	0.5	5.98	9.01	94.0	-0.82	280.9	-26.1	8.59
42120.0	1974 MAR 13.5	0.99	172.3	0.0	353.0	-3.0	5.02	326.7	-0.95	10.3	0.5	5.94	9.01	94.4	-0.81	281.3	-26.1	8.85
42130.0	1974 MAR 23.5	1.00	182.3	0.0	2.1	0.9	5.02	327.6	-0.96	11.2	0.6	5.87	9.01	94.8	-0.79	281.7	-26.1	9.02
42140.0	1974 APR 2.5	1.00	192.2	0.0	11.2	4.8	5.02	328.5	-0.98	12.1	0.6	5.78	9.01	95.2	-0.78	282.1	-26.0	9.18
42150.0	1974 APR 12.5	1.00	202.0	0.0	20.4	8.5	5.02	329.4	-0.99	13.0	0.7	5.68	9.01	95.5	-0.76	282.5	-26.0	9.34
42160.0	1974 APR 22.5	1.01	211.8	0.0	29.6	12.1	5.01	330.3	-1.00	13.9	0.7	5.56	9.01	95.9	-0.75	282.9	-26.0	9.49
42170.0	1974 MAY 2.5	1.01	221.5	0.0	39.1	15.3	5.01	331.2	-1.02	14.8	0.8	5.43	9.01	96.3	-0.73	283.4	-25.9	9.63
42180.0	1974 MAY 12.5	1.01	231.2	0.0	48.8	18.1	5.01	332.0	-1.03	15.7	0.8	5.29	9.01	96.6	-0.71	283.8	-25.9	9.74
42190.0	1974 MAY 22.5	1.01	240.8	0.0	58.7	20.3	5.01	332.9	-1.04	16.6	0.9	5.14	9.01	97.0	-0.70	284.2	-25.9	9.84

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
41350.0	1972 FEB 2.5	18.36	195.3	0.66	355.6	28.8	17.93	30.30	243.0	1.65	229.6	-22.7	30.66	31.26	180.2	16.22	136.9	0.0	30.63
41360.0	1972 FEB 12.5	18.36	195.5	0.66	355.6	29.0	17.78	30.30	243.1	1.65	229.6	-22.7	30.49	31.25	180.3	16.23	136.9	0.0	30.51
41370.0	1972 FEB 22.5	18.36	195.6	0.66	355.6	29.1	17.64	30.30	243.2	1.65	229.7	-22.7	30.32	31.25	180.4	16.24	137.0	0.0	30.41
41380.0	1972 MAR 3.5	18.36	195.7	0.66	355.6	29.2	17.53	30.30	243.2	1.65	229.8	-22.8	30.15	31.24	180.4	16.24	137.1	0.0	30.34
41390.0	1972 MAR 13.5	18.36	195.9	0.66	355.5	29.3	17.45	30.30	243.3	1.65	229.8	-22.8	29.98	31.24	180.5	16.25	137.1	0.0	30.30
41400.0	1972 MAR 23.5	18.36	196.0	0.65	355.5	29.5	17.39	30.30	243.3	1.64	229.9	-22.8	29.82	31.24	180.5	16.25	137.2	0.0	30.28
41410.0	1972 APR 2.5	18.36	196.1	0.65	355.5	29.6	17.36	30.30	243.4	1.64	229.9	-22.8	29.68	31.23	180.6	16.26	137.3	0.0	30.29
41420.0	1972 APR 12.5	18.36	196.2	0.65	355.5	29.7	17.37	30.30	243.5	1.64	230.0	-22.8	29.55	31.23	180.7	16.27	137.3	0.0	30.34
41430.0	1972 APR 22.5	18.36	196.4	0.65	355.4	29.8	17.40	30.30	243.5	1.64	230.1	-22.9	29.45	31.22	180.7	16.27	137.4	0.0	30.40
41440.0	1972 MAY 2.5	18.36	196.5	0.65	355.4	30.0	17.46	30.30	243.6	1.64	230.1	-22.9	29.37	31.22	180.8	16.28	137.4	0.0	30.50
41450.0	1972 MAY 12.5	18.36	196.6	0.65	355.4	30.1	17.55	30.30	243.6	1.64	230.2	-22.9	29.31	31.21	180.9	16.28	137.5	0.0	30.61
41460.0	1972 MAY 22.5	18.36	196.8	0.65	355.4	30.2	17.65	30.30	243.7	1.64	230.2	-22.9	29.29	31.21	180.9	16.29	137.6	0.0	30.74
41470.0	1972 JUN 1.5	18.37	196.9	0.65	355.4	30.3	17.79	30.30	243.7	1.64	230.3	-22.9	29.29	31.20	181.0	16.30	137.6	0.0	30.88
41480.0	1972 JUN 11.5	18.37	197.0	0.65	355.3	30.5	17.94	30.30	243.8	1.64	230.4	-22.9	29.33	31.20	181.1	16.30	137.7	0.0	31.03
41490.0	1972 JUN 21.5	18.37	197.1	0.65	355.3	30.6	18.09	30.30	243.9	1.64	230.4	-23.0	29.39	31.19	181.1	16.31	137.7	0.0	31.19
41500.0	1972 JUL 1.5	18.37	197.3	0.64	355.3	30.7	18.26	30.30	243.9	1.64	230.5	-23.0	29.48	31.19	181.2	16.31	137.8	0.0	31.35
41510.0	1972 JUL 11.5	18.37	197.4	0.64	355.3	30.9	18.43	30.30	244.0	1.64	230.5	-23.0	29.59	31.18	181.2	16.32	137.9	0.0	31.50
41520.0	1972 JUL 21.5	18.37	197.5	0.64	355.2	31.0	18.59	30.30	244.0	1.64	230.6	-23.0	29.72	31.18	181.3	16.32	137.9	0.0	31.64
41530.0	1972 AUG 0.5	18.37	197.6	0.64	355.2	31.1	18.75	30.30	244.1	1.64	230.7	-23.0	29.87	31.17	181.4	16.33	138.0	0.0	31.77
41540.0	1972 AUG 10.5	18.37	197.8	0.64	355.2	31.2	18.90	30.30	244.2	1.64	230.7	-23.1	30.03	31.17	181.4	16.34	138.1	0.0	31.88
41550.0	1972 AUG 20.5	18.37	197.9	0.64	355.2	31.4	19.03	30.30	244.2	1.63	230.8	-23.1	30.20	31.16	181.5	16.34	138.1	0.0	31.97
41560.0	1972 AUG 30.5	18.37	198.0	0.64	355.1	31.5	19.15	30.30	244.3	1.63	230.8	-23.1	30.36	31.16	181.6	16.35	138.2	0.0	32.04
41570.0	1972 SEP 9.5	18.37	198.2	0.64	355.1	31.6	19.24	30.30	244.3	1.63	230.9	-23.1	30.53	31.15	181.6	16.35	138.2	0.0	32.09
41580.0	1972 SEP 19.5	18.38	198.3	0.64	355.1	31.7	19.31	30.30	244.4	1.63	231.0	-23.1	30.69	31.15	181.7	16.35	138.3	0.0	32.11
41590.0	1972 SEP 29.5	18.38	198.4	0.64	355.1	31.9	19.36	30.30	244.5	1.63	231.0	-23.1	30.84	31.14	181.8	16.36	138.4	0.0	32.10
41600.0	1972 OCT 9.5	18.38	198.5	0.64	355.0	32.0	19.37	30.30	244.5	1.63	231.1	-23.2	30.97	31.14	181.8	16.37	138.4	0.0	32.07
41610.0	1972 OCT 19.5	18.38	198.7	0.63	355.0	32.1	19.37	30.30	244.6	1.63	231.2	-23.2	31.08	31.14	181.9	16.38	138.5	0.0	32.01
41620.0	1972 OCT 29.5	18.38	198.8	0.63	355.0	32.2	19.33	30.30	244.6	1.63	231.2	-23.2	31.17	31.13	182.0	16.38	138.5	0.0	31.93
41630.0	1972 NOV 8.5	18.38	198.9	0.63	355.0	32.4	19.27	30.30	244.7	1.63	231.3	-23.2	31.24	31.13	182.0	16.39	138.6	0.0	31.82
41640.0	1972 NOV 18.5	18.38	199.1	0.63	354.9	32.5	19.18	30.30	244.7	1.63	231.3	-23.2	31.28	31.12	182.1	16.39	138.7	0.0	31.69
41650.0	1972 NOV 28.5	18.38	199.2	0.63	354.9	32.6	19.07	30.30	244.8	1.63	231.4	-23.2	31.28	31.12	182.1	16.40	138.7	0.0	31.54
41660.0	1972 DEC 8.5	18.38	199.3	0.63	354.9	32.7	18.94	30.30	244.9	1.63	231.5	-23.3	31.26	31.11	182.2	16.40	138.8	0.0	31.38
41670.0	1972 DEC 18.5	18.38	199.4	0.63	354.9	32.9	18.79	30.30	244.9	1.63	231.5	-23.3	31.22	31.11	182.3	16.41	138.9	0.0	31.22
41680.0	1972 DEC 28.5	18.38	199.6	0.63	354.8	33.0	18.63	30.30	245.0	1.62	231.6	-23.3	31.14	31.10	182.3	16.42	138.9	0.0	31.05
41690.0	1973 JAN 7.5	18.39	199.7	0.63	354.8	33.1	18.46	30.30	245.0	1.62	231.6	-23.3	31.04	31.10	182.4	16.42	139.0	0.0	30.88
41700.0	1973 JAN 17.5	18.39	199.8	0.63	354.8	33.2	18.29	30.30	245.1	1.62	231.7	-23.3	30.91	31.09	182.5	16.43	139.0	0.0	30.71
41710.0	1973 JAN 27.5	18.39	199.9	0.62	354.8	33.4	18.12	30.30	245.2	1.62	231.8	-23.4	30.77	31.09	182.5	16.43	139.1	0.0	30.56
41720.0	1973 FEB 6.5	18.39	200.1	0.62	354.7	33.5	17.96	30.30	245.2	1.62	231.8	-23.4	30.61	31.08	182.6	16.44	139.2	0.0	30.43
41730.0	1973 FEB 16.5	18.39	200.2	0.62	354.7	33.6	17.81	30.30	245.3	1.62	231.9	-23.4	30.45	31.08	182.7	16.44	139.2	0.0	30.31
41740.0	1973 FEB 26.5	18.39	200.3	0.62	354.7	33.7	17.68	30.30	245.3	1.62	231.9	-23.4	30.28	31.07	182.7	16.45	139.3	0.0	30.22
41750.0	1973 MAR 8.5	18.39	200.5	0.62	354.7	33.9	17.56	30.30	245.4	1.62	232.0	-23.4	30.10	31.07	182.8	16.45	139.4	0.0	30.15
41760.0	1973 MAR 18.5	18.39	200.6	0.62	354.6	34.0	17.48	30.30	245.5	1.62	232.1	-23.4	29.94	31.07	182.9	16.46	139.4	0.0	30.12
41770.0	1973 MAR 28.5	18.39	200.7	0.62	354.6	34.1	17.42	30.30	245.5	1.62	232.1	-23.5	29.78	31.06	182.9	16.46	139.5	0.0	30.11
41780.0	1973 APR 7.5	18.39	200.8	0.62	354.6	34.3	17.39	30.30	245.6	1.62	232.2	-23.5	29.64	31.06	183.0	16.47	139.5	0.0	30.13
41790.0	1973 APR 17.5	18.39	201.0	0.62	354.6	34.4	17.40	30.30	245.6	1.62	232.3	-23.5	29.52	31.05	183.0	16.47	139.6	0.0	30.18
41800.0	1973 APR 27.5	18.40	201.1	0.61	354.5	34.5	17.43	30.30	245.7	1.62	232.3	-23.5	29.42	31.05	183.1	16.48	139.7	0.0	30.25
41810.0	1973 MAY 7.5	18.40	201.2	0.61	354.5	34.6	17.49	30.30	245.7	1.62	232.4	-23.5	29.35	31.04	183.2	16.49	139.7	0.0	30.35
41820.0	1973 MAY 17.5	18.40	201.3	0.61	354.5	34.8	17.58	30.30	245.8	1.61	232.4	-23.5	29.30	31.04	183.2	16.49	139.8	0.0	30.47
41830.0	1973 MAY 27.5	18.40	201.5	0.61	354.5	34.9	17.69	30.30	245.9	1.61	232.5	-23.6	29.28	31.03	183.3	16.50	139.8	0.0	30.60
41840.0	1973 JUN 6.5	18.40	201.6	0.61	354.4	35.0	17.82	30.30	245.9	1.61	232.6	-23.6	29.30	31.03	183.4	16.50	139.9	0.0	30.74
41850.0	1973 JUN 16.5	18.40	201.7	0.61	354.4	35.1	17.97	30.30	246.0	1.61	232.6	-23.6	29.34	31.02	183.4	16.51	140.0	0.0	30.90
41860.0	1973 JUN 26.5	18.40	201.9	0.61	354.4	35.3	18.12	30.30	246.0	1.61	232.7	-23.6	29.41	31.02	183.5	16.51	140.0	0.0	31.05
41870.0	1973 JUL 6.5	18.40	202.0	0.61	354.4	35.4	18.29	30.30	246.1	1.61	232.7	-23.6	29.50	31.02	183.6	16.52	140.1	0.0	31.21
41880.0	1973 JUL 16.5	18.40	202.1	0.61	354.3	35.5	18.46	30.30	246.2	1.61	232.8	-23.6	29.62	31.01	183.6	16.52	140.2	0.0	31.36
41890.0	1973 JUL 26.5	18.40	202.2	0.61	354.3	35.6	18.62	30.30	246.2	1.61	232.9	-23.7	29.75	31.01	183.7	16.53	140.2	0.0	31.50
41900.0	1973 AUG 5.5	18.41	202.4	0.60	354.3	35.8	18.78	30.30	246.3	1.61	232.9	-23.7	29.91	31.00	183.8	16.53	140.3	0.0	31.62
41910.0	1973 AUG 15.5	18.41	202.5	0.60	354.3	35.9	18.93	30.30	246.3	1.61	233.0	-23.7	30.07	31.00	183.8	16.54	140.3	0.0	31.73
41920.0	1973 AUG 25.5	18.41	202.6	0.60	354.2	36.0	19.06	30.30	246.4	1.61	233.1	-23.7	30.23	30.99	183.9	16.54	140.4	0.0	31.82
41930.0	1973 SEP 4.5	18.41	202.7	0.60	354.2	36.1	19.18	30.30	246.5	1.61	233.1	-23.7	30.40	30.99	184.0	16.55	140.5	0.0	31.89
41940.0	1973 SEP 14.5	18.41	202.9	0.60	354.2	36.3	19.27	30.30	246.5	1.61	233.2	-23.8	30.57	30.98	184.0	16.55	140.5	0.0	31.93
41950.0	1973 SEP 24.5	18.41	203.0	0.60	354.1	36.4	19.34	30.30	246.6	1.60	233.2	-23.8	30.73	30.98	184.1	16.56	140.6	0.0	31.94
41960.0	1973 OCT 4.5	18.41	203.1	0.60	354.1	36.5	19.39	30.30	246.6	1.60	233.3	-23.8	30.87	30.97	184.2	16.56	140.7	0.0	31.93
41970.0	1973 OCT 14.5	18.41	203.3	0.60	354.1	36.6	19.41	30.30	246.7	1.60	233.4	-23.8	31.00	30.97	184.2	16.57	140.7	0.0	31.89
41980.0	1973 OCT 24.5	18.41	203.4	0.60	354.1	36.8	19.40	30.30	246.7	1.60	233.4	-23.8	31.11	30.97	184.3	16.57	140.8	0.0	31.82
41990.0	1973 NOV 3.5	18.41	203.5	0.59	354.0	36.9	19.36	30.30	246.8	1.60	233.5	-23.8	31.19	30.96	184.3	16.58	140.8	0.0	31.73
42000.0	1973 NOV 13.5	18.42	203.6	0.59	354.0	37.0	19.30	30.30	246.9	1.60	233.5	-23.9	31.25	30.96	184.4	16.58	140.9	0.0	31.62
42010.0	1973 NOV 23.5	18.42	203.8	0.59	354.0	37.1	19.21	30.30	246.9	1.60	233.6	-23.9	31.28	30.95	184.5	16.59	141.0	0.0	31.49
42020.0	1973 DEC 3.5	18.42	203.9	0.59	354.0	37.3	19.10	30.30	247.0	1.60	233.7	-23.9	31.28	30.95	184.5	16.59	141.0	0.0	31.34
42030.0	1973 DEC 13.5	18.42	204.0	0.59	353.9	37.4	18.97	30.30	247.0	1.60	233.7	-23.9	31.25	30.94	184.6	16.60	141.1	0.0	31.18
42040.0	1973 DEC 23.5	18.42	204.1	0.59	353.9	37.5	18.82	30.29	247.1	1.60	233.8	-23.9	31.19	30.94	184.7	16.60	141.2	0.0	31.01
42050.0	1974 JAN 2.5	18.42	204.3	0.59	353.9	37.6	18.66	30.29	247.2	1.60	233.9	-23.9	31.11	30.93	184.7	16.61	141.2	0.0	30.84
42060.0	1974 JAN 12.5	18.42	204.4	0.59	353.8	37.8	18.49	30.29	247.2	1.60	233.9	-24.0	31.00	30.93	184.8	16.61	141.3	0.0	30.57
42070.0	1974 JAN 22.5	18.42	204.5	0.59	353.8	37.9	18.32	30.29	247.3	1.60	234.0	-24.0	30.87	30.93	184.9	16.62	141.3	0.0	30.51
42080.0	1974 FEB 1.5	18.42	204.7	0.58	353.8	38.0	18.15	30.29	247.3	1.59	234.0	-24.0	30.73	30.92	184.9	16.62	141.4	0.0	30.36
42090.0	1974 FEB 11.5	18.42	204.8	0.58	353.8	38.1	17.99	30.29	247.4	1.59	234.1	-24.0	30.57	30.92	185.0	16.63	141.5	0.0	30.23
42100.0	1974 FEB 21.5	18.43	204.9	0.58	353.7	38.3	17.84	30.29	247.5	1.59	234.2	-24.0	30.40	30.91	185.1	16.63	141.5	0.0	30.12
42110.0	1974 MAR 3.5	18.43	205.0	0.58	353.7	38.4	17.71	30.29	247.5	1.59	234.2	-24.0	30.23	30.91	185.1	16.64	141.6	0.0	30.04
42120.0	1974 MAR 13.5	18.43	205.2	0.58	353.7	38.5	17.60	30.29	247.6	1.59	234.3	-24.1	30.06	30.90	185.2	16.64	141.7	0.0	29.98
42130.0	1974 MAR 23.5	18.43	205.3	0.58	353.6	38.6	17.52	30.29	247.6	1.59	234.3	-24.1	29.89	30.90	185.3	16.64	141.7	0.0	29.95
42140.0	1974 APR 2.5	18.43	205.4	0.58	353.6	38.8	17.46	30.29	247.7	1.59	234.4	-24.1	29.74	30.89	185.3	16.65	141.8	0.0	29.95
42150.0	1974 APR 12.5	18.43	205.5	0.58	353.6	38.9	17.43	30.29	247.7	1.59	234.5	-24.1	29.60	30.89	185.4	16.65	141.8	0.0	29.97
42160.0	1974 APR 22.5	18.43	205.7	0.58	353.6	39.0	17.43	30.29	247.8	1.59	234.5	-24.1	29.49	30.89	185.5	16.66	141.9	0.0	30.03
42170.0	1974 MAY 2.5	18.43	205.8	0.57	353.5	39.1	17.47	30.29	247.9	1.59	234.6	-24.1	29.39	30.88	185.5	16.66	142.0	0.0	30.11
42180.0	1974 MAY 12.5	18.43	205.9	0.57	353.5	39.3	17.53	30.29	247.9	1.59	234.7	-24.2	29.33	30.88	185.6	16.67	142.0	0.0	30.21
42190.0	1974 MAY 22.5	18.44	206.1	0.57	353.5	39.4	17.61	30.29	248.0	1.59	234.7	-24.2	29.29	30.87	185.6	16.67	142.1	0.0	30.33

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
42200.0	1974 JUN 1.5	1.01	250.4	0.0	68.8	22.0	5.00	333.8	-1.05	17.4	0.9	4.99	9.01	97.4	-0.68	284.6	-25.8	9.92
42210.0	1974 JUN 11.5	1.02	260.0	0.0	79.1	23.1	5.00	334.7	-1.07	18.3	1.0	4.84	9.01	97.8	-0.67	285.0	-25.8	9.98
42220.0	1974 JUN 21.5	1.02	269.5	0.0	89.5	23.4	5.00	335.6	-1.08	19.2	1.0	4.68	9.01	98.1	-0.65	285.4	-25.7	10.02
42230.0	1974 JUL 1.5	1.02	279.1	0.0	99.9	23.1	5.00	336.5	-1.09	20.1	1.1	4.53	9.01	98.5	-0.64	285.8	-25.7	10.03
42240.0	1974 JUL 11.5	1.02	288.6	0.0	110.2	22.2	5.00	337.4	-1.10	21.0	1.1	4.39	9.01	98.9	-0.62	286.3	-25.6	10.01
42250.0	1974 JUL 21.5	1.02	298.1	0.0	120.3	20.5	4.99	338.3	-1.11	21.9	1.1	4.27	9.01	99.3	-0.60	286.7	-25.6	9.98
42260.0	1974 AUG 0.5	1.02	307.7	0.0	130.1	18.3	4.99	339.2	-1.12	22.8	1.2	4.16	9.01	99.6	-0.59	287.1	-25.5	9.92
42270.0	1974 AUG 10.5	1.01	317.3	0.0	139.7	15.7	4.99	340.1	-1.13	23.7	1.2	4.07	9.01	100.0	-0.57	287.5	-25.5	9.84
42280.0	1974 AUG 20.5	1.01	326.9	0.0	149.1	12.6	4.99	341.0	-1.14	24.6	1.3	4.01	9.01	100.4	-0.56	287.9	-25.4	9.74
42290.0	1974 AUG 30.5	1.01	336.5	0.0	158.3	9.1	4.99	341.9	-1.15	25.5	1.3	3.98	9.01	100.8	-0.54	288.3	-25.4	9.62
42300.0	1974 SEP 9.5	1.01	346.2	0.0	167.3	5.4	4.98	342.9	-1.16	26.4	1.4	3.98	9.01	101.1	-0.53	288.7	-25.3	9.48
42310.0	1974 SEP 19.5	1.00	356.0	0.0	176.3	1.5	4.98	343.8	-1.17	27.4	1.4	4.01	9.01	101.5	-0.51	289.1	-25.3	9.33
42320.0	1974 SEP 29.5	1.00	5.8	0.0	185.3	-2.3	4.98	344.7	-1.18	28.3	1.5	4.06	9.01	101.9	-0.49	289.5	-25.2	9.18
42330.0	1974 OCT 9.5	1.00	15.6	0.0	194.4	-6.2	4.98	345.6	-1.19	29.2	1.5	4.14	9.01	102.3	-0.48	289.9	-25.2	9.01
42340.0	1974 OCT 19.5	1.00	25.5	0.0	203.7	-9.9	4.98	346.5	-1.20	30.1	1.5	4.25	9.02	102.6	-0.46	290.4	-25.1	8.85
42350.0	1974 OCT 29.5	0.99	35.5	0.0	213.2	-13.4	4.97	347.4	-1.20	31.0	1.6	4.37	9.02	103.0	-0.45	290.8	-25.0	8.68
42360.0	1974 NOV 8.5	0.99	45.5	0.0	223.0	-15.5	4.97	348.3	-1.21	31.9	1.6	4.51	9.02	103.4	-0.43	291.2	-25.0	8.53
42370.0	1974 NOV 18.5	0.99	55.6	0.0	233.2	-19.2	4.97	349.2	-1.22	32.8	1.7	4.66	9.02	103.8	-0.41	291.6	-24.9	8.39
42380.0	1974 NOV 28.5	0.99	65.7	0.0	243.8	-21.3	4.97	350.1	-1.23	33.7	1.7	4.82	9.02	104.1	-0.40	292.0	-24.9	8.27
42390.0	1974 DEC 8.5	0.98	75.8	0.0	254.6	-22.7	4.97	351.0	-1.23	34.6	1.7	4.98	9.02	104.5	-0.38	292.4	-24.8	8.17
42400.0	1974 DEC 18.5	0.98	86.0	0.0	265.6	-23.4	4.97	351.9	-1.24	35.5	1.8	5.13	9.02	104.9	-0.37	292.8	-24.7	8.09
42410.0	1974 DEC 28.5	0.98	96.2	0.0	276.7	-23.3	4.97	352.8	-1.25	36.4	1.8	5.28	9.02	105.2	-0.35	293.2	-24.7	8.05
42420.0	1975 JAN 7.5	0.98	106.4	0.0	287.8	-22.4	4.96	353.8	-1.25	37.3	1.9	5.42	9.02	105.6	-0.33	293.6	-24.6	8.04
42430.0	1975 JAN 17.5	0.98	116.5	0.0	298.6	-20.9	4.96	354.7	-1.26	38.3	1.9	5.55	9.02	106.0	-0.32	294.0	-24.5	8.06
42440.0	1975 JAN 27.5	0.98	126.7	0.0	309.1	-18.6	4.96	355.6	-1.26	39.2	1.9	5.66	9.02	106.4	-0.30	294.4	-24.5	8.11
42450.0	1975 FEB 6.5	0.99	136.9	0.0	319.3	-15.8	4.96	356.5	-1.27	40.1	2.0	5.75	9.02	106.7	-0.28	294.8	-24.4	8.18
42460.0	1975 FEB 16.5	0.99	147.0	0.0	329.2	-12.5	4.95	357.4	-1.27	41.0	2.0	5.83	9.02	107.1	-0.27	295.2	-24.3	8.29
42470.0	1975 FEB 26.5	0.99	157.1	0.0	338.8	-8.9	4.96	358.3	-1.28	41.9	2.0	5.89	9.02	107.5	-0.25	295.6	-24.3	8.42
42480.0	1975 MAR 8.5	0.99	167.1	0.0	348.1	-5.1	4.96	359.2	-1.28	42.8	2.1	5.93	9.03	107.9	-0.24	296.0	-24.2	8.56
42490.0	1975 MAR 18.5	1.00	177.1	0.0	357.3	-1.2	4.95	0.1	-1.29	43.7	2.1	5.95	9.03	108.2	-0.22	296.4	-24.1	8.72
42500.0	1975 MAR 28.5	1.00	187.0	0.0	6.4	2.8	4.96	1.1	-1.29	44.6	2.2	5.95	9.03	108.6	-0.20	296.8	-24.0	8.88
42510.0	1975 APR 7.5	1.00	196.8	0.0	15.5	6.6	4.95	2.0	-1.29	45.6	2.2	5.93	9.03	109.0	-0.19	297.2	-24.0	9.05
42520.0	1975 APR 17.5	1.00	206.6	0.0	24.7	10.3	4.95	2.9	-1.30	46.5	2.2	5.89	9.03	109.3	-0.17	297.6	-23.9	9.21
42530.0	1975 APR 27.5	1.01	216.4	0.0	34.1	13.7	4.95	3.8	-1.30	47.4	2.3	5.83	9.03	109.7	-0.16	298.0	-23.8	9.37
42540.0	1975 MAY 7.5	1.01	226.1	0.0	43.6	16.7	4.95	4.7	-1.30	48.3	2.3	5.75	9.03	110.1	-0.14	298.4	-23.7	9.52
42550.0	1975 MAY 17.5	1.01	235.8	0.0	53.4	19.2	4.95	5.6	-1.30	49.2	2.3	5.65	9.03	110.5	-0.12	298.8	-23.6	9.65
42560.0	1975 MAY 27.5	1.01	245.4	0.0	63.5	21.2	4.95	6.6	-1.30	50.1	2.4	5.55	9.03	110.8	-0.11	299.2	-23.6	9.77
42570.0	1975 JUN 6.5	1.01	255.0	0.0	73.7	22.6	4.95	7.5	-1.30	51.1	2.4	5.42	9.03	111.2	-0.09	299.6	-23.5	9.87
42580.0	1975 JUN 16.5	1.02	264.5	0.0	84.0	23.3	4.95	8.4	-1.30	52.0	2.4	5.29	9.03	111.6	-0.07	300.0	-23.4	9.95
42590.0	1975 JUN 26.5	1.02	274.1	0.0	94.4	23.4	4.95	9.3	-1.31	52.9	2.4	5.14	9.04	112.0	-0.06	300.4	-23.3	10.01
42600.0	1975 JUL 6.5	1.02	283.6	0.0	104.8	22.8	4.95	10.2	-1.31	53.8	2.5	5.00	9.04	112.3	-0.04	300.8	-23.2	10.04
42610.0	1975 JUL 16.5	1.02	293.1	0.0	115.0	21.5	4.95	11.1	-1.31	54.7	2.5	4.84	9.04	112.7	-0.03	301.2	-23.2	10.05
42620.0	1975 JUL 26.5	1.02	302.7	0.0	125.0	19.6	4.95	12.1	-1.30	55.6	2.5	4.69	9.04	113.1	-0.01	301.6	-23.1	10.04
42630.0	1975 AUG 5.5	1.01	312.2	0.0	134.7	17.1	4.95	13.0	-1.30	56.6	2.6	4.54	9.04	113.4	0.01	302.0	-23.0	10.01
42640.0	1975 AUG 15.5	1.01	321.8	0.0	144.2	14.2	4.95	13.9	-1.30	57.5	2.6	4.40	9.04	113.8	0.02	302.4	-22.9	9.95
42650.0	1975 AUG 25.5	1.01	331.5	0.0	153.5	11.0	4.95	14.8	-1.30	58.4	2.6	4.27	9.04	114.2	0.04	302.8	-22.8	9.87
42660.0	1975 SEP 4.5	1.01	341.1	0.0	162.6	7.4	4.95	15.7	-1.30	59.3	2.6	4.16	9.04	114.6	0.05	303.1	-22.7	9.76
42670.0	1975 SEP 14.5	1.01	350.8	0.0	171.6	3.6	4.95	16.6	-1.30	60.2	2.7	4.07	9.04	114.9	0.07	303.5	-22.6	9.64
42680.0	1975 SEP 24.5	1.00	0.6	0.0	180.6	-0.2	4.95	17.6	-1.29	61.1	2.7	4.00	9.05	115.3	0.09	303.9	-22.5	9.51
42690.0	1975 OCT 4.5	1.00	10.4	0.0	189.6	-4.1	4.95	18.5	-1.29	62.1	2.7	3.96	9.05	115.7	0.10	304.3	-22.4	9.35
42700.0	1975 OCT 14.5	1.00	20.3	0.0	198.8	-7.9	4.95	19.4	-1.29	63.0	2.7	3.96	9.05	116.0	0.12	304.7	-22.3	9.20
42710.0	1975 OCT 24.5	0.99	30.2	0.0	208.2	-11.5	4.95	20.3	-1.28	63.9	2.8	3.98	9.05	116.4	0.13	305.1	-22.2	9.04
42720.0	1975 NOV 3.5	0.99	40.2	0.0	217.8	-14.9	4.95	21.2	-1.28	64.8	2.8	4.03	9.05	116.8	0.15	305.5	-22.1	8.87
42730.0	1975 NOV 13.5	0.99	50.3	0.0	227.8	-17.8	4.95	22.1	-1.28	65.7	2.8	4.11	9.05	117.2	0.17	305.9	-22.0	8.71
42740.0	1975 NOV 23.5	0.99	60.4	0.0	238.2	-20.2	4.95	23.1	-1.27	66.6	2.8	4.21	9.05	117.5	0.18	306.3	-22.0	8.56
42750.0	1975 DEC 3.5	0.99	70.5	0.0	248.9	-22.0	4.95	24.0	-1.27	67.6	2.8	4.34	9.05	117.9	0.20	306.6	-21.9	8.42
42760.0	1975 DEC 13.5	0.98	80.6	0.0	259.8	-23.1	4.95	24.9	-1.26	68.5	2.9	4.48	9.06	118.3	0.22	307.0	-21.8	8.30
42770.0	1975 DEC 23.5	0.98	90.8	0.0	270.9	-23.4	4.95	25.8	-1.26	69.4	2.9	4.63	9.06	118.6	0.23	307.4	-21.7	8.20
42780.0	1976 JAN 2.5	0.98	101.0	0.0	282.0	-23.0	4.96	26.7	-1.25	70.3	2.9	4.79	9.06	119.0	0.25	307.8	-21.6	8.13
42790.0	1976 JAN 12.5	0.98	111.2	0.0	292.9	-21.8	4.96	27.6	-1.24	71.2	2.9	4.94	9.06	119.4	0.26	308.2	-21.5	8.09
42800.0	1976 JAN 22.5	0.98	121.4	0.0	303.6	-19.9	4.96	28.5	-1.24	72.1	2.9	5.10	9.06	119.7	0.28	308.6	-21.3	8.08
42810.0	1976 FEB 1.5	0.99	131.5	0.0	314.0	-17.3	4.96	29.5	-1.23	73.0	2.9	5.25	9.06	120.1	0.30	308.9	-21.2	8.10
42820.0	1976 FEB 11.5	0.99	141.7	0.0	324.1	-14.3	4.96	30.4	-1.22	74.0	2.9	5.40	9.06	120.5	0.31	309.3	-21.1	8.15
42830.0	1976 FEB 21.5	0.99	151.8	0.0	333.8	-10.8	4.96	31.3	-1.22	74.9	3.0	5.53	9.07	120.9	0.33	309.7	-21.0	8.23
42840.0	1976 MAR 2.5	0.99	161.8	0.0	343.3	-7.1	4.96	32.2	-1.21	75.8	3.0	5.65	9.07	121.2	0.34	310.1	-20.9	8.34
42850.0	1976 MAR 12.5	0.99	171.8	0.0	352.5	-3.2	4.96	33.1	-1.20	76.7	3.0	5.75	9.07	121.6	0.36	310.5	-20.8	8.47
42860.0	1976 MAR 22.5	1.00	181.8	0.0	1.6	0.7	4.97	34.0	-1.19	77.6	3.0	5.83	9.07	122.0	0.37	310.8	-20.7	8.61
42870.0	1976 APR 1.5	1.00	191.7	0.0	10.7	4.6	4.97	34.9	-1.18	78.5	3.0	5.90	9.07	122.3	0.39	311.2	-20.6	8.77
42880.0	1976 APR 11.5	1.00	201.5	0.0	19.9	8.4	4.97	35.8	-1.18	79.4	3.0	5.94	9.07	122.7	0.41	311.6	-20.5	8.93
42890.0	1976 APR 21.5	1.01	211.3	0.0	29.2	11.9	4.97	36.7	-1.17	80.4	3.0	5.97	9.08	123.1	0.42	312.0	-20.4	9.10
42900.0	1976 MAY 1.5	1.01	221.0	0.0	38.6	15.1	4.97	37.7	-1.16	81.3	3.0	5.98	9.08	123.4	0.44	312.3	-20.3	9.26
42910.0	1976 MAY 11.5	1.01	230.7	0.0	48.3	17.9	4.97	38.6	-1.15	82.2	3.0	5.96	9.08	123.8	0.45	312.7	-20.2	9.42
42920.0	1976 MAY 21.5	1.01	240.3	0.0	58.2	20.2	4.97	39.5	-1.14	83.1	3.0	5.93	9.08	124.2	0.47	313.1	-20.1	9.57
42930.0	1976 JUN 0.5	1.01	249.9	0.0	68.3	22.0	4.98	40.4	-1.13	84.0	3.1	5.88	9.08	124.5	0.49	313.5	-19.9	9.70
42940.0	1976 JUN 10.5	1.02	259.5	0.0	78.6	23.0	4.98	41.3	-1.12	84.9	3.1	5.81	9.08	124.9	0.50	313.8	-19.8	9.82
42950.0	1976 JUN 20.5	1.02	269.0	0.0	89.0	23.4	4.98	42.2	-1.11	85.8	3.1	5.72	9.09	125.3	0.52	314.2	-19.7	9.92
42960.0	1976 JUL 0.5	1.02	278.6	0.0	99.4	23.2	4.98	43.1	-1.09	86.7	3.1	5.62	9.09	125.6	0.53	314.6	-19.5	10.00
42970.0	1976 JUL 10.5	1.02	288.1	0.0	109.6	22.2	4.98	44.0	-1.08	87.6	3.1	5.50	9.09	126.0	0.55	314.9	-19.5	10.06
42980.0	1976 JUL 20.5	1.02	297.7	0.0	119.7	20.6	4.98	44.9	-1.07	88.5	3.1	5.37	9.09	126.4	0.56	315.3	-19.4	10.10
42990.0	1976 JUL 30.5	1.02	307.2	0.0	129.6	18.5	4.99	45.8	-1.06	89.4	3.1	5.24	9.09	126.7	0.58	315.7	-19.2	10.11
43000.0	1976 AUG 9.5	1.01	316.8	0.0	139.3	15.8	4.99	46.7	-1.05	90.3	3.1	5.09	9.09	127.1	0.59	316.1	-19.1	10.09
43010.0	1976 AUG 19.5	1.01	326.4	0.0	148.5	12.7	4.99	47.6	-1.03	91.2	3.1	4.94	9.10	127.5	0.61	316.4	-19.0	10.06
43020.0	1976 AUG 29.5	1.01	336.0	0.0	157.8	9.3	4.99	48.5	-1.02	92.1	3.1	4.79	9.10	127.9	0.63	316.8	-18.9	10.00
43030.0	1976 SEP 8.5	1.01	345.7	0.0	166.9	5.6	4.99	49.4	-1.01	93.0	3.1	4.64	9.10	128.2	0.64	317.2	-18.8	9.92
43040.0	1976 SEP 18.5	1.00	355.5	0.0	175.9	1.8	5.00	50.3	-1.00	93.9	3.1	4.49	9.10	128.6	0.66	317.5	-18.6	9.82

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
42200.0	1974 JUN 1.5	18.44	206.2	0.57	353.4	39.5	17.72	30.29	248.0	1.58	234.8	-24.2	29.28	30.87	185.7	16.68	142.2	0.0	30.47
42210.0	1974 JUN 11.5	18.44	206.3	0.57	353.4	39.6	17.85	30.29	248.1	1.58	234.8	-24.2	29.30	30.86	185.8	16.68	142.2	0.0	30.62
42220.0	1974 JUN 21.5	18.44	206.4	0.57	353.4	39.8	18.00	30.29	248.2	1.58	234.9	-24.2	29.35	30.86	185.8	16.69	142.3	0.0	30.77
42230.0	1974 JUL 1.5	18.44	206.6	0.57	353.4	39.9	18.16	30.29	248.2	1.58	235.0	-24.2	29.42	30.86	185.9	16.69	142.4	0.0	30.93
42240.0	1974 JUL 11.5	18.44	206.7	0.57	353.3	40.0	18.33	30.29	248.3	1.58	235.0	-24.3	29.53	30.85	186.0	16.69	142.4	0.0	31.08
42250.0	1974 JUL 21.5	18.44	206.8	0.57	353.3	40.1	18.49	30.29	248.3	1.58	235.1	-24.3	29.65	30.85	186.0	16.70	142.5	0.0	31.23
42260.0	1974 AUG 0.5	18.44	206.9	0.56	353.3	40.3	18.66	30.29	248.4	1.58	235.2	-24.3	29.79	30.84	186.1	16.70	142.5	0.0	31.36
42270.0	1974 AUG 10.5	18.44	207.1	0.56	353.2	40.4	18.82	30.29	248.5	1.58	235.2	-24.3	29.94	30.84	186.2	16.71	142.6	0.0	31.49
42280.0	1974 AUG 20.5	18.45	207.2	0.56	353.2	40.5	18.97	30.29	248.5	1.58	235.3	-24.3	30.10	30.83	186.2	16.71	142.7	0.0	31.59
42290.0	1974 AUG 30.5	18.45	207.3	0.56	353.2	40.5	19.10	30.29	248.6	1.58	235.3	-24.3	30.27	30.83	186.3	16.72	142.7	0.0	31.67
42300.0	1974 SEP 9.5	18.45	207.4	0.56	353.1	40.8	19.22	30.29	248.6	1.58	235.4	-24.3	30.44	30.83	186.4	16.72	142.8	0.0	31.73
42310.0	1974 SEP 19.5	18.45	207.6	0.56	353.1	40.9	19.31	30.29	248.7	1.58	235.5	-24.4	30.61	30.82	186.4	16.73	142.9	0.0	31.77
42320.0	1974 SEP 29.5	18.45	207.7	0.56	353.1	41.0	19.38	30.29	248.8	1.57	235.5	-24.4	30.76	30.82	186.5	16.73	142.9	0.0	31.78
42330.0	1974 OCT 9.5	18.45	207.8	0.56	353.1	41.1	19.43	30.29	248.8	1.57	235.6	-24.4	30.90	30.81	186.6	16.73	143.0	0.0	31.76
42340.0	1974 OCT 19.5	18.45	208.0	0.55	353.0	41.3	19.45	30.29	248.9	1.57	235.7	-24.4	31.02	30.81	186.6	16.74	143.0	0.0	31.71
42350.0	1974 OCT 29.5	18.45	208.1	0.55	353.0	41.4	19.44	30.29	248.9	1.57	235.7	-24.4	31.12	30.80	186.7	16.74	143.1	0.0	31.64
42360.0	1974 NOV 8.5	18.45	208.2	0.55	353.0	41.5	19.40	30.29	249.0	1.57	235.8	-24.4	31.20	30.80	186.8	16.75	143.2	0.0	31.55
42370.0	1974 NOV 18.5	18.46	208.3	0.55	352.9	41.6	19.34	30.29	249.0	1.57	235.8	-24.5	31.25	30.80	186.8	16.75	143.2	0.0	31.43
42380.0	1974 NOV 28.5	18.46	208.5	0.55	352.9	41.8	19.25	30.29	249.1	1.57	235.9	-24.5	31.28	30.79	186.9	16.75	143.3	0.0	31.29
42390.0	1974 DEC 8.5	18.46	208.6	0.55	352.9	41.9	19.14	30.29	249.2	1.57	236.0	-24.5	31.27	30.79	187.0	16.76	143.4	0.0	31.14
42400.0	1974 DEC 18.5	18.46	208.7	0.55	352.8	42.0	19.01	30.29	249.2	1.57	236.0	-24.5	31.23	30.78	187.0	16.76	143.4	0.0	30.98
42410.0	1974 DEC 28.5	18.46	208.8	0.55	352.8	42.1	18.86	30.29	249.3	1.57	236.1	-24.5	31.17	30.78	187.1	16.77	143.5	0.0	30.81
42420.0	1975 JAN 7.5	18.46	209.0	0.55	352.8	42.3	18.70	30.29	249.3	1.57	236.1	-24.5	31.08	30.77	187.2	16.77	143.6	0.0	30.64
42430.0	1975 JAN 17.5	18.46	209.1	0.54	352.7	42.4	18.53	30.29	249.4	1.57	236.2	-24.6	30.97	30.77	187.2	16.78	143.6	0.0	30.47
42440.0	1975 JAN 27.5	18.46	209.2	0.54	352.7	42.5	18.36	30.29	249.5	1.56	236.3	-24.6	30.83	30.77	187.3	16.78	143.7	0.0	30.32
42450.0	1975 FEB 6.5	18.46	209.3	0.54	352.7	42.6	18.19	30.29	249.5	1.56	236.3	-24.6	30.68	30.76	187.4	16.78	143.7	0.0	30.17
42460.0	1975 FEB 16.5	18.47	209.5	0.54	352.6	42.8	18.03	30.29	249.6	1.56	236.4	-24.6	30.52	30.76	187.4	16.79	143.8	0.0	30.05
42470.0	1975 FEB 26.5	18.47	209.6	0.54	352.6	42.9	17.88	30.29	249.6	1.56	236.5	-24.6	30.35	30.75	187.5	16.79	143.9	0.0	29.94
42480.0	1975 MAR 8.5	18.47	209.7	0.54	352.6	43.0	17.75	30.29	249.7	1.56	236.5	-24.6	30.18	30.75	187.6	16.80	143.9	0.0	29.86
42490.0	1975 MAR 18.5	18.47	209.9	0.54	352.5	43.1	17.64	30.29	249.8	1.56	236.6	-24.6	30.01	30.75	187.6	16.80	144.0	0.0	29.81
42500.0	1975 MAR 28.5	18.47	210.0	0.54	352.5	43.2	17.56	30.29	249.8	1.56	236.6	-24.7	29.85	30.74	187.7	16.80	144.1	0.0	29.79
42510.0	1975 APR 7.5	18.47	210.1	0.53	352.5	43.4	17.50	30.29	249.9	1.56	236.7	-24.7	29.70	30.74	187.8	16.81	144.1	0.0	29.79
42520.0	1975 APR 17.5	18.47	210.2	0.53	352.5	43.5	17.47	30.29	249.9	1.56	236.8	-24.7	29.57	30.73	187.8	16.81	144.2	0.0	29.83
42530.0	1975 APR 27.5	18.47	210.4	0.53	352.4	43.6	17.47	30.29	250.0	1.56	236.8	-24.7	29.46	30.73	187.9	16.82	144.2	0.0	29.89
42540.0	1975 MAY 7.5	18.48	210.5	0.53	352.4	43.7	17.51	30.29	250.0	1.56	236.9	-24.7	29.37	30.72	188.0	16.82	144.3	0.0	29.97
42550.0	1975 MAY 17.5	18.48	210.6	0.53	352.4	43.9	17.57	30.29	250.1	1.55	237.0	-24.7	29.31	30.72	188.0	16.82	144.4	0.0	30.08
42560.0	1975 MAY 27.5	18.48	210.7	0.53	352.3	44.0	17.65	30.29	250.2	1.55	237.0	-24.8	29.28	30.72	188.1	16.83	144.4	0.0	30.20
42570.0	1975 JUN 6.5	18.48	210.9	0.53	352.3	44.1	17.76	30.29	250.2	1.55	237.1	-24.8	29.28	30.71	188.2	16.83	144.5	0.0	30.34
42580.0	1975 JUN 16.5	18.48	211.0	0.53	352.3	44.2	17.90	30.29	250.3	1.55	237.1	-24.8	29.31	30.71	188.2	16.84	144.6	0.0	30.49
42590.0	1975 JUN 26.5	18.48	211.1	0.52	352.2	44.4	18.04	30.29	250.3	1.55	237.2	-24.8	29.36	30.70	188.3	16.84	144.6	0.0	30.65
42600.0	1975 JUL 6.5	18.48	211.2	0.52	352.2	44.5	18.20	30.29	250.4	1.55	237.3	-24.8	29.44	30.70	188.4	16.84	144.7	0.0	30.81
42610.0	1975 JUL 16.5	18.48	211.4	0.52	352.1	44.6	18.37	30.29	250.5	1.55	237.3	-24.8	29.55	30.70	188.4	16.85	144.8	0.0	30.96
42620.0	1975 JUL 26.5	18.49	211.5	0.52	352.1	44.7	18.53	30.29	250.5	1.55	237.4	-24.9	29.68	30.69	188.5	16.85	144.8	0.0	31.10
42630.0	1975 AUG 5.5	18.49	211.6	0.52	352.1	44.9	18.70	30.29	250.6	1.55	237.5	-24.9	29.82	30.69	188.6	16.85	144.9	0.0	31.24
42640.0	1975 AUG 15.5	18.49	211.7	0.52	352.0	45.0	18.86	30.29	250.6	1.55	237.5	-24.9	29.98	30.68	188.6	16.86	144.9	0.0	31.36
42650.0	1975 AUG 25.5	18.49	211.9	0.52	352.0	45.1	19.01	30.29	250.7	1.55	237.6	-24.9	30.14	30.68	188.7	16.86	145.0	0.0	31.46
42660.0	1975 SEP 4.5	18.49	212.0	0.52	352.0	45.2	19.14	30.29	250.8	1.55	237.7	-24.9	30.31	30.68	188.7	16.87	145.1	0.0	31.53
42670.0	1975 SEP 14.5	18.49	212.1	0.51	351.9	45.4	19.26	30.29	250.8	1.54	237.7	-24.9	30.48	30.67	188.8	16.87	145.1	0.0	31.59
42680.0	1975 SEP 24.5	18.49	212.3	0.51	351.9	45.5	19.35	30.29	250.9	1.54	237.8	-24.9	30.64	30.67	188.9	16.87	145.2	0.0	31.62
42690.0	1975 OCT 4.5	18.49	212.4	0.51	351.9	45.6	19.43	30.29	250.9	1.54	237.8	-25.0	30.79	30.66	188.9	16.88	145.3	0.0	31.62
42700.0	1975 OCT 14.5	18.50	212.5	0.51	351.8	45.7	19.47	30.29	251.0	1.54	237.9	-25.0	30.93	30.66	189.0	16.88	145.3	0.0	31.60
42710.0	1975 OCT 24.5	18.50	212.6	0.51	351.8	45.8	19.49	30.29	251.0	1.54	238.0	-25.0	31.05	30.66	189.1	16.88	145.4	0.0	31.55
42720.0	1975 NOV 3.5	18.50	212.8	0.51	351.9	46.0	19.48	30.29	251.1	1.54	238.0	-25.0	31.14	30.65	189.1	16.89	145.5	0.0	31.47
42730.0	1975 NOV 13.5	18.50	212.9	0.51	351.7	46.1	19.45	30.29	251.2	1.54	238.1	-25.0	31.21	30.65	189.2	16.89	145.5	0.0	31.37
42740.0	1975 NOV 23.5	18.50	213.0	0.51	351.7	46.2	19.38	30.29	251.2	1.54	238.2	-25.0	31.26	30.64	189.3	16.89	145.5	0.0	31.25
42750.0	1975 DEC 3.5	18.50	213.1	0.50	351.7	46.3	19.29	30.29	251.3	1.54	238.2	-25.0	31.27	30.64	189.3	16.90	145.6	0.0	31.11
42760.0	1975 DEC 13.5	18.50	213.3	0.50	351.6	46.5	19.18	30.29	251.3	1.54	238.3	-25.1	31.26	30.64	189.4	16.90	145.7	0.0	30.95
42770.0	1975 DEC 23.5	18.50	213.4	0.50	351.6	46.6	19.05	30.29	251.4	1.54	238.3	-25.1	31.22	30.63	189.5	16.90	145.8	0.0	30.79
42780.0	1976 JAN 2.5	18.51	213.5	0.50	351.5	46.7	18.90	30.29	251.5	1.53	238.4	-25.1	31.15	30.63	189.5	16.91	145.8	0.0	30.62
42790.0	1976 JAN 12.5	18.51	213.6	0.50	351.5	46.8	18.74	30.29	251.5	1.53	238.5	-25.1	31.05	30.62	189.6	16.91	145.9	0.0	30.45
42800.0	1976 JAN 22.5	18.51	213.8	0.50	351.5	47.0	18.57	30.29	251.6	1.53	238.5	-25.1	30.93	30.62	189.7	16.91	146.0	0.0	30.29
42810.0	1976 FEB 1.5	18.51	213.9	0.50	351.4	47.1	18.40	30.29	251.6	1.53	238.6	-25.1	30.79	30.62	189.7	16.92	146.0	0.0	30.13
42820.0	1976 FEB 11.5	18.51	214.0	0.49	351.4	47.2	18.24	30.29	251.7	1.53	238.7	-25.2	30.64	30.61	189.8	16.92	146.1	0.0	29.99
42830.0	1976 FEB 21.5	18.51	214.1	0.49	351.4	47.3	18.07	30.29	251.8	1.53	238.7	-25.2	30.47	30.61	189.9	16.92	146.2	0.0	29.87
42840.0	1976 MAR 2.5	18.51	214.3	0.49	351.3	47.5	17.93	30.29	251.8	1.53	238.8	-25.2	30.30	30.60	189.9	16.93	146.2	0.0	29.77
42850.0	1976 MAR 12.5	18.51	214.4	0.49	351.3	47.6	17.80	30.29	251.9	1.53	238.8	-25.2	30.13	30.60	190.0	16.93	146.3	0.0	29.70
42860.0	1976 MAR 22.5	18.52	214.5	0.49	351.2	47.7	17.69	30.29	251.9	1.53	238.9	-25.2	29.96	30.60	190.1	16.93	146.4	0.0	29.65
42870.0	1976 APR 1.5	18.52	214.6	0.49	351.2	47.8	17.60	30.29	252.0	1.53	239.0	-25.2	29.80	30.59	190.1	16.94	146.4	0.0	29.64
42880.0	1976 APR 11.5	18.52	214.8	0.49	351.2	47.9	17.54	30.29	252.0	1.53	239.0	-25.2	29.66	30.59	190.2	16.94	146.5	0.0	29.65
42890.0	1976 APR 21.5	18.52	214.9	0.49	351.1	48.1	17.52	30.29	252.1	1.52	239.1	-25.3	29.53	30.58	190.3	16.94	146.5	0.0	29.69
42900.0	1976 MAY 1.5	18.52	215.0	0.48	351.1	48.2	17.52	30.29	252.2	1.52	239.2	-25.3	29.43	30.58	190.3	16.95	146.6	0.0	29.76
42910.0	1976 MAY 11.5	18.52	215.1	0.48	351.1	48.3	17.55	30.28	252.2	1.52	239.2	-25.3	29.35	30.58	190.4	16.95	146.7	0.0	29.85
42920.0	1976 MAY 21.5	18.52	215.3	0.48	351.0	48.4	17.61	30.28	252.3	1.52	239.3	-25.3	29.30	30.57	190.5	16.95	146.7	0.0	29.96
42930.0	1976 JUN 0.5	18.52	215.4	0.48	351.0	48.5	17.70	30.28	252.3	1.52	239.4	-25.3	29.27	30.57	190.6	16.96	146.8	0.0	30.09
42940.0	1976 JUN 10.5	18.53	215.5	0.48	350.9	48.7	17.81	30.28	252.4	1.52	239.4	-25.3	29.28	30.56	190.6	16.96	146.9	0.0	30.23
42950.0	1976 JUN 20.5	18.53	215.6	0.48	350.9	48.8	17.94	30.28	252.5	1.52	239.5	-25.3	29.31	30.56	190.7	16.96	146.9	0.0	30.38
42960.0	1976 JUL 0.5	18.53	215.8	0.48	350.9	48.9	18.09	30.28	252.5	1.52	239.5	-25.4	29.37	30.56	190.8	16.96	147.0	0.0	30.54
42970.0	1976 JUL 10.5	18.53	215.9	0.47	350.8	49.1	18.25	30.28	252.6	1.52	239.6	-25.4	29.46	30.55	190.8	16.97	147.1	0.0	30.69
42980.0	1976 JUL 20.5	18.53	216.0	0.47	350.8	49.2	18.41	30.28	252.6	1.52	239.7	-25.4	29.57	30.55	190.9	16.97	147.1	0.0	30.84
42990.0	1976 JUL 30.5	18.53	216.2	0.47	350.7	49.3	18.58	30.28	252.7	1.51	239.7	-25.4	29.71	30.55	191.0	16.97	147.2	0.0	30.99
43000.0	1976 AUG 9.5	18.53	216.3	0.47	350.7	49.4	18.75	30.28	252.8	1.51	239.8	-25.4	29.85	30.54	191.0	16.98	147.2	0.0	31.12
43010.0	1976 AUG 19.5	18.54	216.4	0.47	350.7	49.5	18.91	30.28	252.8	1.51	239.9	-25.4	30.01	30.54	191.1	16.98	147.3	0.0	31.23
43020.0	1976 AUG 29.5	18.54	216.5	0.47	350.6	49.7	19.05	30.28	252.9	1.51	239.9	-25.4	30.18	30.53	191.2	16.98	147.4	0.0	31.33
43030.0	1976 SEP 8.5	18.54	216.7	0.47	350.6	49.8	19.19	30.28	252.9	1.51	240.0	-25.5	30.35	30.53	191.2	16.99	147.4	0.0	31.40
43040.0	1976 SEP 18.5	18.54	216.8	0.47	350.5	49.9	19.31	30.28	253.0	1.51	240.0	-25.5	30.52	30.53	191.3	16.99	147.5	0.0	31.45

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
43050.0	1976 SEP 28.5	1.00	5.3	0.0	184.8	-2.1	5.00	51.2	-0.98	94.8	3.1	4.36	9.10	129.0	0.67	317.9	-18.5	9.69
43060.0	1976 OCT 8.5	1.00	15.1	0.0	193.9	-5.0	5.00	52.1	-0.97	95.7	3.1	4.25	9.10	129.3	0.69	318.3	-18.4	9.56
43070.0	1976 OCT 18.5	1.00	25.0	0.0	203.2	-9.7	5.00	53.0	-0.96	96.6	3.0	4.15	9.11	129.7	0.70	318.6	-18.3	9.41
43080.0	1976 OCT 28.5	0.99	35.0	0.0	212.7	-13.2	5.01	53.9	-0.94	97.5	3.0	4.08	9.11	130.1	0.72	319.0	-18.2	9.25
43090.0	1976 NOV 7.5	0.99	45.0	0.0	222.5	-16.3	5.01	54.8	-0.93	98.4	3.0	4.04	9.11	130.4	0.73	319.3	-18.0	9.09
43100.0	1976 NOV 17.5	0.99	55.0	0.0	232.7	-19.0	5.01	55.7	-0.91	99.3	3.0	4.02	9.11	130.8	0.75	319.7	-17.9	8.92
43110.0	1976 NOV 27.5	0.99	65.2	0.0	243.2	-21.2	5.01	56.6	-0.90	100.2	3.0	4.04	9.11	131.1	0.76	320.1	-17.8	8.76
43120.0	1976 DEC 7.5	0.99	75.3	0.0	254.1	-22.6	5.02	57.5	-0.88	101.1	3.0	4.09	9.12	131.5	0.78	320.4	-17.7	8.61
43130.0	1976 DEC 17.5	0.98	85.5	0.0	265.1	-23.4	5.02	58.4	-0.87	102.0	3.0	4.17	9.12	131.9	0.79	320.8	-17.5	8.47
43140.0	1976 DEC 27.5	0.98	95.6	0.0	276.2	-23.3	5.02	59.3	-0.85	102.9	3.0	4.27	9.12	132.2	0.81	321.1	-17.4	8.35
43150.0	1977 JAN 6.5	0.98	105.8	0.0	287.2	-22.5	5.02	60.2	-0.84	103.8	3.0	4.39	9.12	132.6	0.82	321.5	-17.3	8.26
43160.0	1977 JAN 16.5	0.98	116.0	0.0	298.0	-20.9	5.03	61.1	-0.82	104.7	3.0	4.53	9.12	133.0	0.84	321.9	-17.2	8.19
43170.0	1977 JAN 26.5	0.98	126.2	0.0	308.6	-18.7	5.03	62.0	-0.81	105.6	3.0	4.69	9.13	133.3	0.85	322.2	-17.0	8.15
43180.0	1977 FEB 5.5	0.99	136.4	0.0	318.8	-15.9	5.03	62.8	-0.79	106.5	2.9	4.84	9.13	133.7	0.87	322.6	-16.9	8.14
43190.0	1977 FEB 15.5	0.99	146.5	0.0	328.7	-12.7	5.03	63.7	-0.77	107.4	2.9	5.01	9.13	134.1	0.88	322.9	-16.8	8.17
43200.0	1977 FEB 25.5	0.99	156.5	0.0	338.3	-9.1	5.04	64.6	-0.76	108.3	2.9	5.17	9.13	134.4	0.90	323.3	-16.6	8.22
43210.0	1977 MAR 7.5	0.99	166.6	0.0	347.7	-5.3	5.04	65.5	-0.74	109.1	2.9	5.32	9.13	134.8	0.91	323.5	-16.5	8.31
43220.0	1977 MAR 17.5	1.00	176.6	0.0	356.9	-1.4	5.04	66.4	-0.72	110.0	2.9	5.47	9.14	135.2	0.93	324.0	-16.4	8.42
43230.0	1977 MAR 27.5	1.00	186.5	0.0	6.0	2.6	5.05	67.3	-0.71	110.9	2.9	5.60	9.14	135.5	0.94	324.4	-16.2	8.55
43240.0	1977 APR 6.5	1.00	196.3	0.0	15.1	6.4	5.05	68.1	-0.69	111.8	2.8	5.72	9.14	135.9	0.96	324.7	-16.1	8.69
43250.0	1977 APR 16.5	1.00	206.1	0.0	24.3	10.1	5.05	69.0	-0.67	112.7	2.8	5.83	9.14	136.3	0.97	325.1	-16.0	8.85
43260.0	1977 APR 26.5	1.01	215.9	0.0	33.5	13.5	5.05	69.9	-0.66	113.6	2.8	5.92	9.15	136.6	0.99	325.4	-15.8	9.01
43270.0	1977 MAY 6.5	1.01	225.6	0.0	43.2	15.5	5.06	70.8	-0.64	114.4	2.8	5.99	9.15	137.0	1.00	325.8	-15.7	9.18
43280.0	1977 MAY 16.5	1.01	235.3	0.0	52.9	19.1	5.06	71.7	-0.62	115.3	2.8	6.04	9.15	137.3	1.01	326.1	-15.6	9.34
43290.0	1977 MAY 26.5	1.01	244.9	0.0	62.9	21.1	5.06	72.5	-0.60	116.2	2.8	6.07	9.15	137.7	1.03	326.5	-15.4	9.50
43300.0	1977 JUN 5.5	1.01	254.5	0.0	73.2	22.5	5.07	73.4	-0.59	117.1	2.7	6.08	9.15	138.1	1.04	326.8	-15.3	9.65
43310.0	1977 JUN 15.5	1.02	264.0	0.0	83.5	23.3	5.07	74.3	-0.57	117.9	2.7	6.07	9.16	138.4	1.06	327.2	-15.2	9.78
43320.0	1977 JUN 25.5	1.02	273.6	0.0	93.9	23.4	5.07	75.2	-0.55	118.8	2.7	6.05	9.16	138.8	1.07	327.5	-15.0	9.90
43330.0	1977 JUL 5.5	1.02	283.1	0.0	104.3	22.8	5.08	76.0	-0.53	119.7	2.7	6.00	9.16	139.2	1.09	327.9	-14.9	10.00
43340.0	1977 JUL 15.5	1.02	292.6	0.0	114.5	21.5	5.08	76.9	-0.51	120.6	2.6	5.93	9.16	139.5	1.10	328.2	-14.8	10.08
43350.0	1977 JUL 25.5	1.02	302.2	0.0	124.5	19.7	5.08	77.8	-0.49	121.4	2.6	5.85	9.17	139.9	1.11	328.5	-14.6	10.14
43360.0	1977 AUG 4.5	1.01	311.7	0.0	134.2	17.3	5.09	78.6	-0.48	122.3	2.6	5.75	9.17	140.2	1.13	328.9	-14.5	10.17
43370.0	1977 AUG 14.5	1.01	321.3	0.0	143.7	14.4	5.09	79.5	-0.46	123.2	2.6	5.64	9.17	140.6	1.14	329.2	-14.3	10.18
43380.0	1977 AUG 24.5	1.01	331.0	0.0	153.0	11.1	5.09	80.4	-0.44	124.0	2.5	5.51	9.17	141.0	1.16	329.6	-14.2	10.17
43390.0	1977 SEP 3.5	1.01	340.6	0.0	162.1	7.5	5.10	81.2	-0.42	124.9	2.5	5.37	9.17	141.3	1.17	329.9	-14.1	10.13
43400.0	1977 SEP 13.5	1.01	350.3	0.0	171.1	3.8	5.10	82.1	-0.40	125.8	2.5	5.23	9.18	141.7	1.18	330.3	-13.9	10.07
43410.0	1977 SEP 23.5	1.00	0.1	0.0	180.1	-0.0	5.10	83.0	-0.38	126.6	2.5	5.08	9.18	142.0	1.20	330.6	-13.8	9.99
43420.0	1977 OCT 3.5	1.00	9.9	0.0	189.1	-3.9	5.11	83.8	-0.36	127.5	2.4	4.92	9.18	142.4	1.21	331.0	-13.6	9.88
43430.0	1977 OCT 13.5	1.00	19.8	0.0	198.3	-7.8	5.11	84.7	-0.35	128.4	2.4	4.77	9.18	142.8	1.23	331.3	-13.5	9.76
43440.0	1977 OCT 23.5	0.99	29.7	0.0	207.7	-11.4	5.11	85.6	-0.33	129.2	2.4	4.63	9.19	143.1	1.24	331.6	-13.4	9.62
43450.0	1977 NOV 2.5	0.99	39.7	0.0	217.3	-14.7	5.12	86.4	-0.31	130.1	2.3	4.50	9.19	143.5	1.25	332.0	-13.2	9.47
43460.0	1977 NOV 12.5	0.99	49.7	0.0	227.3	-17.7	5.12	87.3	-0.29	130.9	2.3	4.38	9.19	143.8	1.27	332.3	-13.1	9.31
43470.0	1977 NOV 22.5	0.99	59.8	0.0	237.7	-20.1	5.12	88.1	-0.27	131.8	2.3	4.28	9.19	144.2	1.28	332.7	-12.9	9.15
43480.0	1977 DEC 2.5	0.99	70.0	0.0	248.3	-22.0	5.13	89.0	-0.25	132.6	2.3	4.21	9.20	144.6	1.29	333.0	-12.8	8.99
43490.0	1977 DEC 12.5	0.98	80.1	0.0	259.3	-23.1	5.13	89.8	-0.23	133.5	2.2	4.16	9.20	144.9	1.31	333.3	-12.6	8.82
43500.0	1977 DEC 22.5	0.98	90.3	0.0	270.3	-23.4	5.13	90.7	-0.21	134.4	2.2	4.15	9.20	145.3	1.32	333.7	-12.5	8.67
43510.0	1978 JAN 1.5	0.98	100.5	0.0	281.4	-23.0	5.14	91.5	-0.19	135.2	2.2	4.17	9.20	145.6	1.33	334.0	-12.4	8.54
43520.0	1978 JAN 11.5	0.98	110.7	0.0	292.4	-21.9	5.14	92.4	-0.17	136.1	2.1	4.22	9.21	146.0	1.35	334.3	-12.2	8.42
43530.0	1978 JAN 21.5	0.98	120.9	0.0	303.1	-20.0	5.15	93.2	-0.15	136.9	2.1	4.30	9.21	146.4	1.36	334.7	-12.1	8.33
43540.0	1978 FEB 0.5	0.99	131.0	0.0	313.5	-17.5	5.15	94.1	-0.14	137.7	2.1	4.40	9.21	146.7	1.37	335.0	-11.9	8.27
43550.0	1978 FEB 10.5	0.99	141.2	0.0	323.6	-14.4	5.15	94.9	-0.12	138.6	2.0	4.53	9.21	147.1	1.38	335.3	-11.8	8.23
43560.0	1978 FEB 20.5	0.99	151.3	0.0	333.3	-11.0	5.15	95.8	-0.10	139.4	2.0	4.67	9.22	147.4	1.40	335.7	-11.5	8.23
43570.0	1978 MAR 2.5	0.99	161.3	0.0	342.8	-7.3	5.16	96.6	-0.08	140.3	2.0	4.82	9.22	147.8	1.41	336.0	-11.5	8.26
43580.0	1978 MAR 12.5	0.99	171.3	0.0	352.0	-3.4	5.16	97.5	-0.06	141.1	1.9	4.98	9.22	148.1	1.42	336.3	-11.3	8.32
43590.0	1978 MAR 22.5	1.00	181.3	0.0	1.2	0.5	5.17	98.3	-0.04	142.0	1.9	5.14	9.22	148.5	1.44	336.7	-11.2	8.40
43600.0	1978 APR 1.5	1.00	191.2	0.0	10.3	4.4	5.17	99.1	-0.02	142.8	1.9	5.30	9.23	148.9	1.45	337.0	-11.0	8.51
43610.0	1978 APR 11.5	1.00	201.0	0.0	19.4	8.2	5.17	100.0	-0.00	143.6	1.8	5.46	9.23	149.2	1.46	337.3	-10.9	8.65
43620.0	1978 APR 21.5	1.01	210.8	0.0	28.7	11.8	5.18	100.8	0.02	144.5	1.8	5.60	9.23	149.6	1.47	337.7	-10.8	8.79
43630.0	1978 MAY 1.5	1.01	220.5	0.0	38.1	15.0	5.18	101.7	0.04	145.3	1.7	5.74	9.23	149.9	1.49	338.0	-10.6	8.95
43640.0	1978 MAY 11.5	1.01	230.2	0.0	47.8	17.8	5.19	102.5	0.06	146.2	1.7	5.86	9.24	150.3	1.50	338.3	-10.5	9.11
43650.0	1978 MAY 21.5	1.01	239.8	0.0	57.7	20.1	5.19	103.3	0.07	147.0	1.7	5.96	9.24	150.6	1.51	338.7	-10.3	9.28
43660.0	1978 JUN 0.5	1.01	249.4	0.0	67.8	21.9	5.19	104.2	0.09	147.8	1.6	6.05	9.24	151.0	1.52	339.0	-10.2	9.44
43670.0	1978 JUN 10.5	1.02	259.0	0.0	78.1	23.0	5.20	105.0	0.11	148.7	1.6	6.13	9.25	151.4	1.54	339.3	-10.0	9.60
43680.0	1978 JUN 20.5	1.02	268.6	0.0	88.4	23.4	5.20	105.8	0.13	149.5	1.6	6.18	9.25	151.7	1.55	339.6	-9.9	9.75
43690.0	1978 JUL 0.5	1.02	278.1	0.0	98.8	23.2	5.20	106.7	0.15	150.3	1.5	6.21	9.25	152.1	1.56	340.0	-9.7	9.88
43700.0	1978 JUL 10.5	1.02	287.6	0.0	109.1	22.3	5.21	107.5	0.17	151.1	1.5	6.22	9.25	152.4	1.57	340.3	-9.6	10.00
43710.0	1978 JUL 20.5	1.02	297.2	0.0	119.2	20.7	5.21	108.3	0.19	152.0	1.4	6.22	9.26	152.8	1.58	340.6	-9.4	10.10
43720.0	1978 JUL 30.5	1.02	306.7	0.0	129.1	18.6	5.21	109.1	0.21	152.8	1.4	6.19	9.26	153.1	1.60	341.0	-9.3	10.18
43730.0	1978 AUG 9.5	1.01	316.3	0.0	138.8	16.0	5.22	110.0	0.23	153.6	1.4	6.14	9.26	153.5	1.61	341.3	-9.1	10.23
43740.0	1978 AUG 19.5	1.01	325.9	0.0	148.2	12.9	5.22	110.8	0.24	154.5	1.3	6.08	9.26	153.8	1.62	341.6	-9.0	10.27
43750.0	1978 AUG 29.5	1.01	335.5	0.0	157.4	9.5	5.23	111.6	0.26	155.3	1.3	5.99	9.27	154.2	1.63	341.9	-8.8	10.28
43760.0	1978 SEP 8.5	1.01	345.2	0.0	166.4	5.3	5.23	112.4	0.28	156.1	1.2	5.89	9.27	154.5	1.64	342.2	-8.7	10.26
43770.0	1978 SEP 18.5	1.00	355.0	0.0	175.4	2.0	5.23	113.3	0.30	156.9	1.2	5.78	9.27	154.9	1.65	342.6	-8.5	10.22
43780.0	1978 SEP 28.5	1.00	4.8	0.0	184.4	-1.9	5.24	114.1	0.32	157.7	1.2	5.65	9.27	155.3	1.66	342.9	-8.4	10.16
43790.0	1978 OCT 8.5	1.00	14.6	0.0	193.5	-5.8	5.24	114.9	0.33	158.6	1.1	5.51	9.28	155.6	1.68	343.2	-8.2	10.07
43800.0	1978 OCT 18.5	1.00	24.5	0.0	202.7	-9.5	5.24	115.7	0.35	159.4	1.1	5.36	9.28	156.0	1.69	343.5	-8.1	9.97
43810.0	1978 OCT 28.5	0.99	34.5	0.0	212.2	-13.0	5.25	116.5	0.37	160.2	1.0	5.20	9.28	156.3	1.70	343.9	-7.9	9.84
43820.0	1978 NOV 7.5	0.99	44.5	0.0	222.0	-14.2	5.25	117.3	0.39	161.0	1.0	5.05	9.29	156.7	1.71	344.2	-7.8	9.70
43830.0	1978 NOV 17.5	0.99	54.5	0.0	232.2	-18.9	5.25	118.2	0.41	161.8	1.0	4.90	9.29	157.0	1.72	344.5	-7.6	9.55
43840.0	1978 NOV 27.5	0.99	64.6	0.0	242.7	-21.1	5.26	119.0	0.42	162.6	0.9	4.75	9.29	157.4	1.73	344.8	-7.5	9.39
43850.0	1978 DEC 7.5	0.99	74.8	0.0	253.5	-22.6	5.26	119.8	0.44	163.4	0.9	4.62	9.29	157.7	1.74	345.1	-7.3	9.23
43860.0	1978 DEC 17.5	0.98	84.9	0.0	264.5	-23.4	5.25	120.6	0.46	164.2	0.8	4.50	9.30	158.1	1.75	345.5	-7.1	9.06
43870.0	1978 DEC 27.5	0.98	95.1	0.0	275.6	-23.4	5.27	121.4	0.48	165.1	0.8	4.41	9.30	158.4	1.76	345.8	-7.0	8.90
43880.0	1979 JAN 6.5	0.98	105.3	0.0	286.6	-22.6	5.27	122.2	0.49	165.9	0.7	4.34	9.30	158.8	1.78	346.1	-6.8	8.75
43890.0	1979 JAN 16.5	0.98	115.5	0.0	297.5	-21.0	5.28	123.0	0.51	166.7	0.7	4.30	9.31	159.1	1.79	346.4	-6.7	8.62

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
43050.0	1976 SEP 28.5	18.54	216.9	0.46	350.5	50.0	19.40	30.28	253.1	1.51	240.1	-25.5	30.68	30.52	191.4	16.99	147.6	0.0	31.48
43060.0	1976 OCT 8.5	18.54	217.0	0.46	350.4	50.2	19.47	30.28	253.1	1.51	240.2	-25.5	30.82	30.52	191.4	16.99	147.6	0.0	31.47
43070.0	1976 OCT 18.5	18.54	217.2	0.46	350.4	50.3	19.52	30.28	253.2	1.51	240.2	-25.5	30.96	30.51	191.5	17.00	147.7	0.0	31.44
43080.0	1976 OCT 28.5	18.55	217.3	0.46	350.4	50.4	19.54	30.28	253.2	1.51	240.3	-25.5	31.07	30.51	191.6	17.00	147.8	0.0	31.39
43090.0	1976 NOV 7.5	18.55	217.4	0.46	350.3	50.5	19.53	30.28	253.3	1.51	240.4	-25.5	31.16	30.51	191.6	17.00	147.8	0.0	31.30
43100.0	1976 NOV 17.5	18.55	217.5	0.46	350.3	50.6	19.49	30.28	253.3	1.50	240.4	-25.6	31.22	30.50	191.7	17.00	147.9	0.0	31.20
43110.0	1976 NOV 27.5	18.55	217.7	0.46	350.2	50.8	19.43	30.28	253.4	1.50	240.5	-25.6	31.26	30.50	191.8	17.01	148.0	0.0	31.07
43120.0	1976 DEC 7.5	18.55	217.8	0.45	350.2	50.9	19.34	30.28	253.5	1.50	240.6	-25.6	31.27	30.50	191.8	17.01	148.0	0.0	30.93
43130.0	1976 DEC 17.5	18.55	217.9	0.45	350.2	51.0	19.23	30.28	253.5	1.50	240.6	-25.6	31.25	30.49	191.9	17.01	148.1	0.0	30.77
43140.0	1976 DEC 27.5	18.55	218.0	0.45	350.1	51.1	19.10	30.28	253.6	1.50	240.7	-25.6	31.20	30.49	192.0	17.02	148.2	0.0	30.61
43150.0	1977 JAN 6.5	18.55	218.2	0.45	350.1	51.3	18.95	30.28	253.6	1.50	240.7	-25.6	31.12	30.48	192.0	17.02	148.2	0.0	30.44
43160.0	1977 JAN 16.5	18.56	218.3	0.45	350.0	51.4	18.79	30.28	253.7	1.50	240.8	-25.6	31.02	30.48	192.1	17.02	148.3	0.0	30.27
43170.0	1977 JAN 26.5	18.56	218.4	0.45	350.0	51.5	18.62	30.28	253.8	1.50	240.9	-25.7	30.89	30.48	192.2	17.02	148.3	0.0	30.11
43180.0	1977 FEB 5.5	18.56	218.5	0.45	349.9	51.6	18.45	30.28	253.8	1.50	240.9	-25.7	30.75	30.47	192.2	17.03	148.4	0.0	29.96
43190.0	1977 FEB 15.5	18.56	218.7	0.44	349.9	51.7	18.28	30.28	253.9	1.50	241.0	-25.7	30.59	30.47	192.3	17.03	148.5	0.0	29.82
43200.0	1977 FEB 25.5	18.56	218.8	0.44	349.8	51.9	18.12	30.28	253.9	1.49	241.1	-25.7	30.42	30.47	192.4	17.03	148.5	0.0	29.71
43210.0	1977 MAR 7.5	18.56	218.9	0.44	349.8	52.0	17.97	30.28	254.0	1.49	241.1	-25.7	30.25	30.46	192.4	17.03	148.6	0.0	29.61
43220.0	1977 MAR 17.5	18.56	219.0	0.44	349.8	52.1	17.84	30.28	254.1	1.49	241.2	-25.7	30.08	30.46	192.5	17.04	148.7	0.0	29.55
43230.0	1977 MAR 27.5	18.57	219.2	0.44	349.7	52.2	17.73	30.28	254.1	1.49	241.3	-25.7	29.92	30.46	192.6	17.04	148.7	0.0	29.51
43240.0	1977 APR 6.5	18.57	219.3	0.44	349.7	52.4	17.65	30.28	254.2	1.49	241.3	-25.7	29.76	30.45	192.6	17.04	148.8	0.0	29.50
43250.0	1977 APR 16.5	18.57	219.4	0.44	349.6	52.5	17.59	30.28	254.2	1.49	241.4	-25.8	29.62	30.45	192.7	17.04	148.9	0.0	29.52
43260.0	1977 APR 26.5	18.57	219.5	0.44	349.6	52.6	17.57	30.28	254.3	1.49	241.4	-25.8	29.50	30.44	192.8	17.05	148.9	0.0	29.56
43270.0	1977 MAY 6.5	18.57	219.7	0.43	349.5	52.7	17.57	30.28	254.3	1.49	241.5	-25.8	29.40	30.44	192.8	17.05	149.0	0.0	29.64
43280.0	1977 MAY 16.5	18.57	219.8	0.43	349.5	52.8	17.60	30.28	254.4	1.49	241.6	-25.8	29.33	30.44	192.9	17.05	149.1	0.0	29.73
43290.0	1977 MAY 26.5	18.57	219.9	0.43	349.4	53.0	17.66	30.28	254.5	1.49	241.6	-25.8	29.28	30.43	193.0	17.05	149.1	0.0	29.85
43300.0	1977 JUN 5.5	18.58	220.0	0.43	349.4	53.1	17.75	30.28	254.5	1.48	241.7	-25.8	29.27	30.43	193.0	17.05	149.2	0.0	29.98
43310.0	1977 JUN 15.5	18.58	220.2	0.43	349.3	53.2	17.86	30.28	254.6	1.48	241.8	-25.8	29.28	30.43	193.1	17.06	149.2	0.0	30.12
43320.0	1977 JUN 25.5	18.58	220.3	0.43	349.3	53.3	17.99	30.28	254.6	1.48	241.8	-25.9	29.32	30.42	193.2	17.06	149.3	0.0	30.28
43330.0	1977 JUL 5.5	18.58	220.4	0.43	349.2	53.5	18.14	30.28	254.7	1.48	241.9	-25.9	29.39	30.42	193.2	17.06	149.4	0.0	30.43
43340.0	1977 JUL 15.5	18.58	220.5	0.42	349.2	53.5	18.29	30.28	254.8	1.48	242.0	-25.9	29.48	30.42	193.3	17.06	149.4	0.0	30.59
43350.0	1977 JUL 25.5	18.58	220.7	0.42	349.1	53.7	18.46	30.28	254.8	1.48	242.0	-25.9	29.60	30.41	193.4	17.07	149.5	0.0	30.74
43360.0	1977 AUG 4.5	18.58	220.8	0.42	349.1	53.8	18.63	30.28	254.9	1.48	242.1	-25.9	29.74	30.41	193.4	17.07	149.6	0.0	30.88
43370.0	1977 AUG 14.5	18.59	220.9	0.42	349.0	53.9	18.80	30.28	254.9	1.48	242.1	-25.9	29.89	30.40	193.5	17.07	149.6	0.0	31.01
43380.0	1977 AUG 24.5	18.59	221.0	0.42	349.0	54.1	18.96	30.28	255.0	1.48	242.2	-25.9	30.05	30.40	193.6	17.07	149.7	0.0	31.12
43390.0	1977 SEP 3.5	18.59	221.2	0.42	348.9	54.2	19.10	30.28	255.1	1.48	242.3	-25.9	30.22	30.40	193.7	17.07	149.8	0.0	31.21
43400.0	1977 SEP 13.5	18.59	221.3	0.42	348.9	54.3	19.24	30.28	255.1	1.47	242.3	-26.0	30.39	30.39	193.7	17.08	149.8	0.0	31.28
43410.0	1977 SEP 23.5	18.59	221.4	0.41	348.8	54.4	19.36	30.28	255.2	1.47	242.4	-26.0	30.55	30.39	193.8	17.08	149.9	0.0	31.32
43420.0	1977 OCT 3.5	18.59	221.5	0.41	348.8	54.5	19.45	30.28	255.2	1.47	242.5	-26.0	30.71	30.39	193.9	17.08	150.0	0.0	31.34
43430.0	1977 OCT 13.5	18.59	221.7	0.41	348.7	54.7	19.52	30.28	255.3	1.47	242.5	-26.0	30.85	30.38	193.9	17.08	150.0	0.0	31.33
43440.0	1977 OCT 23.5	18.60	221.8	0.41	348.7	54.8	19.57	30.28	255.4	1.47	242.6	-26.0	30.98	30.38	194.0	17.08	150.1	0.0	31.30
43450.0	1977 NOV 2.5	18.60	221.9	0.41	348.6	54.9	19.59	30.28	255.4	1.47	242.7	-26.0	31.09	30.38	194.1	17.09	150.2	0.0	31.23
43460.0	1977 NOV 12.5	18.60	222.0	0.41	348.5	55.0	19.58	30.28	255.5	1.47	242.7	-26.0	31.17	30.37	194.1	17.09	150.2	0.0	31.15
43470.0	1977 NOV 22.5	18.60	222.2	0.41	348.5	55.1	19.54	30.28	255.5	1.47	242.8	-26.1	31.23	30.37	194.2	17.09	150.3	0.0	31.04
43480.0	1977 DEC 2.5	18.60	222.3	0.40	348.5	55.3	19.48	30.28	255.6	1.47	242.8	-26.1	31.26	30.37	194.3	17.09	150.4	0.0	30.91
43490.0	1977 DEC 12.5	18.60	222.4	0.40	348.4	55.4	19.39	30.28	255.6	1.47	242.9	-26.1	31.26	30.36	194.3	17.09	150.4	0.0	30.76
43500.0	1977 DEC 22.5	18.60	222.5	0.40	348.4	55.5	19.28	30.28	255.7	1.46	243.0	-26.1	31.23	30.36	194.4	17.10	150.5	0.0	30.60
43510.0	1978 JAN 1.5	18.61	222.7	0.40	348.3	55.6	19.15	30.28	255.8	1.46	243.0	-26.1	31.17	30.35	194.5	17.10	150.5	0.0	30.44
43520.0	1978 JAN 11.5	18.61	222.8	0.40	348.3	55.8	19.00	30.28	255.8	1.46	243.1	-26.1	31.09	30.35	194.5	17.10	150.6	0.0	30.27
43530.0	1978 JAN 21.5	18.61	222.9	0.40	348.2	55.9	18.84	30.28	255.9	1.46	243.2	-26.1	30.98	30.35	194.6	17.10	150.7	0.0	30.10
43540.0	1978 FEB 0.5	18.61	223.0	0.40	348.2	56.0	18.67	30.28	255.9	1.46	243.2	-26.1	30.85	30.34	194.7	17.10	150.7	0.0	29.94
43550.0	1978 FEB 10.5	18.61	223.2	0.39	348.1	56.1	18.50	30.28	256.0	1.46	243.3	-26.2	30.70	30.34	194.7	17.10	150.8	0.0	29.79
43560.0	1978 FEB 20.5	18.61	223.3	0.39	348.0	56.2	18.33	30.28	256.1	1.46	243.4	-26.2	30.54	30.34	194.8	17.11	150.9	0.0	29.66
43570.0	1978 MAR 2.5	18.62	223.4	0.39	348.0	56.4	18.17	30.28	256.1	1.46	243.4	-26.2	30.38	30.33	194.9	17.11	150.9	0.0	29.55
43580.0	1978 MAR 12.5	18.62	223.5	0.39	347.9	56.5	18.02	30.28	256.2	1.46	243.5	-26.2	30.20	30.33	194.9	17.11	151.0	0.0	29.46
43590.0	1978 MAR 22.5	18.62	223.6	0.39	347.9	56.6	17.89	30.28	256.2	1.45	243.6	-26.2	30.03	30.33	195.0	17.11	151.1	0.0	29.40
43600.0	1978 APR 1.5	18.62	223.8	0.39	347.8	56.7	17.79	30.28	256.3	1.45	243.6	-26.2	29.87	30.32	195.1	17.11	151.1	0.0	29.37
43610.0	1978 APR 11.5	18.62	223.9	0.39	347.8	56.8	17.73	30.28	256.4	1.45	243.7	-26.2	29.72	30.32	195.1	17.11	151.2	0.0	29.37
43620.0	1978 APR 21.5	18.62	224.0	0.38	347.7	57.0	17.65	30.28	256.4	1.45	243.7	-26.2	29.58	30.32	195.2	17.12	151.3	0.0	29.39
43630.0	1978 MAY 1.5	18.62	224.1	0.38	347.7	57.1	17.62	30.28	256.5	1.45	243.8	-26.3	29.47	30.31	195.3	17.12	151.3	0.0	29.45
43640.0	1978 MAY 11.5	18.63	224.3	0.38	347.6	57.2	17.62	30.28	256.5	1.45	243.9	-26.3	29.37	30.31	195.4	17.12	151.4	0.0	29.52
43650.0	1978 MAY 21.5	18.63	224.4	0.38	347.5	57.3	17.65	30.27	256.6	1.45	243.9	-26.3	29.31	30.31	195.4	17.12	151.5	0.0	29.63
43660.0	1978 JUN 0.5	18.63	224.5	0.38	347.5	57.4	17.71	30.27	256.6	1.45	244.0	-26.3	29.27	30.30	195.5	17.12	151.5	0.0	29.74
43670.0	1978 JUN 10.5	18.63	224.6	0.38	347.4	57.6	17.80	30.27	256.7	1.45	244.1	-26.3	29.26	30.30	195.6	17.12	151.6	0.0	29.88
43680.0	1978 JUN 20.5	18.63	224.8	0.38	347.4	57.7	17.91	30.27	256.8	1.45	244.1	-26.3	29.28	30.30	195.6	17.13	151.7	0.0	30.03
43690.0	1978 JUL 0.5	18.63	224.9	0.37	347.3	57.8	18.04	30.27	256.8	1.44	244.2	-26.3	29.33	30.29	195.7	17.13	151.7	0.0	30.18
43700.0	1978 JUL 10.5	18.63	225.0	0.37	347.2	57.9	18.19	30.27	256.9	1.44	244.3	-26.3	29.41	30.29	195.8	17.13	151.8	0.0	30.34
43710.0	1978 JUL 20.5	18.64	225.1	0.37	347.2	58.0	18.35	30.27	256.9	1.44	244.3	-26.4	29.51	30.29	195.8	17.13	151.9	0.0	30.49
43720.0	1978 JUL 30.5	18.64	225.3	0.37	347.1	58.2	18.51	30.27	257.0	1.44	244.4	-26.4	29.63	30.28	195.9	17.13	151.9	0.0	30.64
43730.0	1978 AUG 9.5	18.64	225.4	0.37	347.1	58.3	18.68	30.27	257.1	1.44	244.5	-26.4	29.77	30.28	196.0	17.13	152.0	0.0	30.78
43740.0	1978 AUG 19.5	18.64	225.5	0.37	347.0	58.4	18.85	30.27	257.1	1.44	244.5	-26.4	29.92	30.28	196.0	17.13	152.0	0.0	30.91
43750.0	1978 AUG 29.5	18.64	225.6	0.36	346.9	58.5	19.01	30.27	257.2	1.44	244.6	-26.4	30.09	30.27	196.1	17.13	152.1	0.0	31.01
43760.0	1978 SEP 8.5	18.64	225.8	0.36	346.9	58.5	19.16	30.27	257.2	1.44	244.6	-26.4	30.25	30.27	196.2	17.14	152.2	0.0	31.10
43770.0	1978 SEP 18.5	18.65	225.9	0.36	346.8	58.8	19.29	30.27	257.3	1.44	244.7	-26.4	30.42	30.27	196.2	17.14	152.2	0.0	31.16
43780.0	1978 SEP 28.5	18.65	226.0	0.36	346.7	58.9	19.41	30.27	257.4	1.43	244.8	-26.4	30.59	30.26	196.3	17.14	152.3	0.0	31.20
43790.0	1978 OCT 8.5	18.65	226.1	0.36	346.7	59.0	19.51	30.27	257.4	1.43	244.8	-26.5	30.74	30.26	196.4	17.14	152.4	0.0	31.22
43800.0	1978 OCT 18.5	18.65	226.3	0.36	346.6	59.1	19.58	30.27	257.5	1.43	244.9	-26.5	30.88	30.26	196.4	17.14	152.4	0.0	31.20
43810.0	1978 OCT 28.5	18.65	226.4	0.36	346.5	59.2	19.62	30.27	257.5	1.43	245.0	-26.5	31.01	30.25	196.5	17.14	152.5	0.0	31.16
43820.0	1978 NOV 7.5	18.65	226.5	0.35	346.5	59.4	19.64	30.27	257.6	1.43	245.0	-26.5	31.11	30.25	196.6	17.14	152.6	0.0	31.09
43830.0	1978 NOV 17.5	18.65	226.6	0.35	346.4	59.5	19.63	30.27	257.6	1.43	245.1	-26.5	31.18	30.25	196.7	17.14	152.6	0.0	31.00
43840.0	1978 NOV 27.5	18.66	226.8	0.35	346.4	59.6	19.60	30.27	257.7	1.43	245.2	-26.5	31.23	30.24	196.7	17.15	152.7	0.0	30.89
43850.0	1978 DEC 7.5	18.66	226.9	0.35	346.3	59.7	19.53	30.27	257.8	1.43	245.2	-26.5	31.26	30.24	196.8	17.15	152.8	0.0	30.75
43860.0	1978 DEC 17.5	18.66	227.0	0.35	346.2	59.8	19.44	30.27	257.8	1.43	245.3	-26.5	31.25	30.24	196.9	17.15	152.8	0.0	30.60
43870.0	1978 DEC 27.5	18.66	227.1	0.35	346.2	60.0	19.33	30.27	257.9	1.43	245.4	-26.6	31.21	30.23	196.9	17.15	152.9	0.0	30.44
43880.0	1979 JAN 6.5	18.66	227.2	0.35	346.1	60.1	19.20	30.27	257.9	1.42	245.4	-26.6	31.15	30.23	197.0	17.15	153.0	0.0	30.27
43890.0	1979 JAN 16.5	18.66	227.4	0.34	346.0	60.2	19.05	30.27	258.0	1.42	245.5	-26.6	31.06	30.23	197.1	17.15	153.0	0.0	30.11

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
43900.0	1979 JAN 26.5	0.98	125.7	0.0	308.1	-18.9	5.28	123.8	0.53	167.5	0.7	4.29	9.31	159.5	1.80	346.7	-6.5	8.51
43910.0	1979 FEB 5.5	0.99	135.8	0.0	318.3	-15.1	5.28	124.6	0.54	168.3	0.6	4.32	9.31	159.8	1.81	347.1	-6.4	8.42
43920.0	1979 FEB 15.5	0.99	146.0	0.0	328.2	-12.9	5.29	125.4	0.56	169.1	0.6	4.37	9.31	160.2	1.82	347.4	-6.2	8.36
43930.0	1979 FEB 25.5	0.99	156.0	0.0	337.8	-9.3	5.29	126.2	0.58	169.9	0.5	4.46	9.32	160.5	1.83	347.7	-6.1	8.33
43940.0	1979 MAR 7.5	0.99	166.1	0.0	347.2	-5.5	5.29	127.0	0.59	170.7	0.5	4.56	9.32	160.9	1.84	348.0	-5.9	8.33
43950.0	1979 MAR 17.5	1.00	176.0	0.0	356.4	-1.6	5.30	127.8	0.61	171.5	0.5	4.69	9.32	161.2	1.85	348.3	-5.8	8.37
43960.0	1979 MAR 27.5	1.00	186.0	0.0	5.5	2.4	5.30	128.6	0.63	172.3	0.4	4.83	9.33	161.6	1.86	348.6	-5.6	8.43
43970.0	1979 APR 6.5	1.00	195.8	0.0	14.6	6.2	5.30	129.4	0.64	173.1	0.4	4.99	9.33	161.9	1.87	349.0	-5.5	8.52
43980.0	1979 APR 16.5	1.00	205.6	0.0	23.8	9.9	5.31	130.2	0.66	173.9	0.3	5.15	9.33	162.3	1.88	349.3	-5.3	8.63
43990.0	1979 APR 26.5	1.01	215.4	0.0	33.1	13.3	5.31	131.0	0.67	174.7	0.3	5.31	9.33	162.6	1.89	349.6	-5.2	8.76
44000.0	1979 MAY 6.5	1.01	225.1	0.0	42.7	16.4	5.31	131.8	0.69	175.5	0.2	5.46	9.34	163.0	1.90	349.9	-5.0	8.91
44010.0	1979 MAY 16.5	1.01	234.8	0.0	52.4	19.0	5.32	132.6	0.70	176.3	0.2	5.62	9.34	163.3	1.91	350.2	-4.9	9.07
44020.0	1979 MAY 26.5	1.01	244.4	0.0	62.4	21.0	5.32	133.4	0.72	177.1	0.2	5.76	9.34	163.7	1.92	350.5	-4.7	9.23
44030.0	1979 JUN 5.5	1.01	254.0	0.0	72.6	22.5	5.32	134.2	0.73	177.9	0.1	5.89	9.35	164.0	1.93	350.8	-4.5	9.40
44040.0	1979 JUN 15.5	1.02	263.5	0.0	83.0	23.3	5.32	135.0	0.75	178.6	0.1	6.01	9.35	164.4	1.94	351.2	-4.4	9.56
44050.0	1979 JUN 25.5	1.02	273.1	0.0	93.4	23.4	5.33	135.8	0.76	179.4	0.0	6.11	9.35	164.7	1.95	351.5	-4.2	9.72
44060.0	1979 JUL 5.5	1.02	282.6	0.0	103.7	22.9	5.33	136.6	0.78	180.2	-0.0	6.20	9.36	165.1	1.96	351.8	-4.1	9.87
44070.0	1979 JUL 15.5	1.02	292.1	0.0	113.9	21.6	5.33	137.4	0.79	181.0	-0.1	6.27	9.36	165.4	1.97	352.1	-3.9	10.00
44080.0	1979 JUL 25.5	1.02	301.7	0.0	124.0	19.8	5.34	138.2	0.81	181.8	-0.1	6.32	9.36	165.8	1.97	352.4	-3.8	10.12
44090.0	1979 AUG 4.5	1.01	311.3	0.0	133.7	17.4	5.34	139.0	0.82	182.6	-0.1	6.35	9.36	166.1	1.98	352.7	-3.6	10.21
44100.0	1979 AUG 14.5	1.01	320.8	0.0	143.3	14.5	5.34	139.8	0.83	183.4	-0.2	6.36	9.37	166.5	1.99	353.0	-3.5	10.29
44110.0	1979 AUG 24.5	1.01	330.5	0.0	152.6	11.3	5.35	140.5	0.85	184.2	-0.2	6.34	9.37	166.8	2.00	353.3	-3.3	10.34
44120.0	1979 SEP 3.5	1.01	340.1	0.0	161.7	7.8	5.35	141.3	0.86	184.9	-0.3	6.31	9.37	167.1	2.01	353.6	-3.2	10.37
44130.0	1979 SEP 13.5	1.01	349.8	0.0	170.7	4.0	5.35	142.1	0.87	185.7	-0.3	6.26	9.38	167.5	2.02	354.0	-3.0	10.38
44140.0	1979 SEP 23.5	1.00	359.6	0.0	179.6	0.2	5.35	142.9	0.89	186.5	-0.3	6.19	9.38	167.8	2.03	354.3	-2.9	10.36
44150.0	1979 OCT 3.5	1.00	9.4	0.0	188.7	-3.7	5.36	143.7	0.90	187.3	-0.4	6.10	9.38	168.2	2.04	354.6	-2.7	10.32
44160.0	1979 OCT 13.5	1.00	19.3	0.0	197.8	-7.5	5.36	144.5	0.91	188.1	-0.4	5.99	9.39	168.5	2.05	354.9	-2.6	10.25
44170.0	1979 OCT 23.5	0.99	29.2	0.0	207.2	-11.2	5.36	145.2	0.93	188.9	-0.5	5.87	9.39	168.9	2.05	355.2	-2.4	10.17
44180.0	1979 NOV 2.5	0.99	39.2	0.0	216.8	-14.6	5.37	146.0	0.94	189.6	-0.5	5.73	9.39	169.2	2.05	355.5	-2.2	10.06
44190.0	1979 NOV 12.5	0.99	49.2	0.0	226.8	-17.5	5.37	146.8	0.95	190.4	-0.6	5.59	9.39	169.6	2.07	355.8	-2.1	9.93
44200.0	1979 NOV 22.5	0.99	59.3	0.0	237.1	-20.0	5.37	147.6	0.96	191.2	-0.6	5.43	9.40	169.9	2.08	356.1	-1.9	9.79
44210.0	1979 DEC 2.5	0.99	69.4	0.0	247.8	-21.9	5.37	148.4	0.97	192.0	-0.6	5.27	9.40	170.3	2.09	356.4	-1.8	9.63
44220.0	1979 DEC 12.5	0.98	79.6	0.0	258.7	-23.0	5.38	149.1	0.99	192.7	-0.7	5.12	9.40	170.6	2.10	356.7	-1.6	9.47
44230.0	1979 DEC 22.5	0.98	89.8	0.0	269.8	-23.4	5.38	149.9	1.00	193.5	-0.7	4.96	9.41	170.9	2.10	357.0	-1.5	9.31
44240.0	1980 JAN 1.5	0.98	100.0	0.0	280.9	-23.1	5.38	150.7	1.01	194.3	-0.8	4.82	9.41	171.3	2.11	357.4	-1.3	9.14
44250.0	1980 JAN 11.5	0.98	110.1	0.0	291.8	-21.9	5.38	151.5	1.02	195.1	-0.8	4.69	9.41	171.6	2.12	357.7	-1.2	8.99
44260.0	1980 JAN 21.5	0.98	120.3	0.0	302.5	-20.1	5.39	152.2	1.03	195.8	-0.8	4.58	9.42	172.0	2.13	358.0	-1.0	8.84
44270.0	1980 FEB 0.5	0.99	130.5	0.0	313.0	-17.6	5.39	153.0	1.04	196.6	-0.9	4.49	9.42	172.3	2.13	358.3	-0.9	8.71
44280.0	1980 FEB 10.5	0.99	140.6	0.0	323.1	-14.6	5.39	153.8	1.05	197.4	-0.9	4.44	9.42	172.7	2.14	358.6	-0.7	8.60
44290.0	1980 FEB 20.5	0.99	150.7	0.0	332.8	-11.2	5.39	154.6	1.06	198.2	-1.0	4.41	9.42	173.0	2.15	358.9	-0.6	8.52
44300.0	1980 MAR 1.5	0.99	160.8	0.0	342.3	-7.5	5.40	155.3	1.07	198.9	-1.0	4.41	9.43	173.3	2.16	359.2	-0.4	8.46
44310.0	1980 MAR 11.5	0.99	170.8	0.0	351.6	-3.5	5.40	156.1	1.08	199.7	-1.0	4.44	9.43	173.7	2.16	359.5	-0.3	8.44
44320.0	1980 MAR 21.5	1.00	180.8	0.0	0.7	0.3	5.40	156.9	1.09	200.5	-1.1	4.51	9.43	174.0	2.17	359.8	-0.1	8.45
44330.0	1980 APR 0.5	1.00	190.7	0.0	9.8	4.2	5.40	157.6	1.10	201.2	-1.1	4.60	9.44	174.4	2.18	0.1	0.1	8.48
44340.0	1980 APR 10.5	1.00	200.5	0.0	18.9	8.0	5.40	158.4	1.11	202.0	-1.2	4.71	9.44	174.7	2.19	0.4	0.2	8.55
44350.0	1980 APR 20.5	1.00	210.3	0.0	28.2	11.6	5.41	159.2	1.12	202.8	-1.2	4.84	9.44	175.0	2.19	0.7	0.4	8.64
44360.0	1980 MAY 0.5	1.01	220.0	0.0	37.6	14.8	5.41	160.0	1.13	203.6	-1.2	4.98	9.45	175.4	2.20	1.0	0.5	8.76
44370.0	1980 MAY 10.5	1.01	229.7	0.0	47.3	17.7	5.41	160.7	1.14	204.3	-1.3	5.14	9.45	175.7	2.21	1.3	0.7	8.89
44380.0	1980 MAY 20.5	1.01	239.3	0.0	57.1	20.0	5.41	161.5	1.15	205.1	-1.3	5.29	9.45	176.1	2.21	1.6	0.8	9.04
44390.0	1980 MAY 30.5	1.01	248.9	0.0	67.2	21.8	5.41	162.3	1.15	205.9	-1.3	5.45	9.46	176.4	2.22	1.9	1.0	9.20
44400.0	1980 JUN 9.5	1.02	258.5	0.0	77.5	23.0	5.42	163.0	1.16	206.6	-1.4	5.61	9.46	176.7	2.23	2.2	1.1	9.37
44410.0	1980 JUN 19.5	1.02	268.1	0.0	87.9	23.4	5.42	163.8	1.17	207.4	-1.4	5.75	9.46	177.1	2.23	2.5	1.3	9.53
44420.0	1980 JUN 29.5	1.02	277.6	0.0	98.3	23.2	5.42	164.6	1.18	208.1	-1.4	5.89	9.47	177.4	2.24	2.8	1.4	9.70
44430.0	1980 JUL 9.5	1.02	287.1	0.0	108.6	22.3	5.42	165.3	1.19	208.9	-1.5	6.02	9.47	177.8	2.25	3.2	1.6	9.85
44440.0	1980 JUL 19.5	1.02	296.7	0.0	118.7	20.8	5.42	166.1	1.19	209.7	-1.5	6.13	9.47	178.1	2.25	3.5	1.7	10.00
44450.0	1980 JUL 29.5	1.02	306.2	0.0	128.6	18.7	5.43	166.8	1.20	210.4	-1.6	6.23	9.47	178.4	2.26	3.8	1.9	10.13
44460.0	1980 AUG 8.5	1.01	315.8	0.0	138.3	16.1	5.43	167.6	1.21	211.2	-1.6	6.31	9.48	178.8	2.27	4.1	2.0	10.24
44470.0	1980 AUG 18.5	1.01	325.4	0.0	147.7	13.1	5.43	168.4	1.21	212.0	-1.6	6.37	9.48	179.1	2.27	4.4	2.2	10.34
44480.0	1980 AUG 28.5	1.01	335.0	0.0	156.9	9.7	5.43	169.1	1.22	212.7	-1.7	6.41	9.48	179.5	2.28	4.7	2.3	10.41
44490.0	1980 SEP 7.5	1.01	344.7	0.0	166.0	5.0	5.43	169.9	1.23	213.5	-1.7	6.44	9.49	179.8	2.28	5.0	2.5	10.46
44500.0	1980 SEP 17.5	1.00	354.5	0.0	174.9	2.2	5.43	170.7	1.23	214.2	-1.7	6.44	9.49	180.1	2.29	5.3	2.6	10.49
44510.0	1980 SEP 27.5	1.00	4.2	0.0	183.9	-1.7	5.43	171.4	1.24	215.0	-1.8	6.41	9.49	180.5	2.30	5.6	2.8	10.49
44520.0	1980 OCT 7.5	1.00	14.1	0.0	193.0	-5.6	5.44	172.2	1.24	215.8	-1.8	6.37	9.50	180.8	2.30	5.9	2.9	10.47
44530.0	1980 OCT 17.5	1.00	24.0	0.0	202.2	-9.3	5.44	172.9	1.25	216.5	-1.8	6.31	9.50	181.1	2.31	6.2	3.1	10.42
44540.0	1980 OCT 27.5	0.99	33.9	0.0	211.7	-12.8	5.44	173.7	1.25	217.3	-1.9	6.23	9.50	181.5	2.31	6.5	3.2	10.35
44550.0	1980 NOV 6.5	0.99	44.0	0.0	221.5	-15.0	5.44	174.5	1.26	218.0	-1.9	6.13	9.51	181.8	2.32	6.8	3.4	10.26
44560.0	1980 NOV 16.5	0.99	54.0	0.0	231.7	-18.8	5.44	175.2	1.26	218.8	-1.9	6.01	9.51	182.2	2.32	7.1	3.5	10.15
44570.0	1980 NOV 26.5	0.99	64.1	0.0	242.1	-21.0	5.44	176.0	1.27	219.6	-2.0	5.88	9.51	182.5	2.33	7.4	3.7	10.02
44580.0	1980 DEC 6.5	0.99	74.3	0.0	252.9	-22.5	5.44	176.7	1.27	220.3	-2.0	5.74	9.51	182.8	2.33	7.7	3.8	9.87
44590.0	1980 DEC 16.5	0.98	84.4	0.0	263.9	-23.3	5.44	177.5	1.27	221.1	-2.0	5.58	9.52	183.2	2.34	8.0	4.0	9.72
44600.0	1980 DEC 26.5	0.98	94.6	0.0	275.0	-23.4	5.44	178.3	1.28	221.8	-2.0	5.42	9.52	183.5	2.34	8.3	4.1	9.55
44610.0	1981 JAN 5.5	0.98	104.8	0.0	286.1	-22.6	5.45	179.0	1.28	222.6	-2.1	5.26	9.52	183.8	2.35	8.6	4.3	9.39
44620.0	1981 JAN 15.5	0.98	115.0	0.0	296.9	-21.1	5.45	179.8	1.28	223.4	-2.1	5.11	9.53	184.2	2.35	8.9	4.4	9.22
44630.0	1981 JAN 25.5	0.98	125.2	0.0	307.5	-19.0	5.45	180.5	1.29	224.1	-2.1	4.95	9.53	184.5	2.36	9.2	4.6	9.07
44640.0	1981 FEB 4.5	0.99	135.3	0.0	317.8	-16.2	5.45	181.3	1.29	224.9	-2.2	4.82	9.53	184.8	2.36	9.5	4.7	8.93
44650.0	1981 FEB 14.5	0.99	145.4	0.0	327.7	-13.0	5.45	182.0	1.29	225.6	-2.2	4.69	9.54	185.2	2.37	9.8	4.9	8.80
44660.0	1981 FEB 24.5	0.99	155.5	0.0	337.3	-9.5	5.45	182.8	1.29	226.4	-2.2	4.59	9.54	185.5	2.37	10.1	5.0	8.70
44670.0	1981 MAR 6.5	0.99	165.5	0.0	346.7	-5.7	5.45	183.6	1.30	227.1	-2.2	4.52	9.54	185.8	2.38	10.4	5.2	8.62
44680.0	1981 MAR 16.5	0.99	175.5	0.0	355.9	-1.8	5.45	184.3	1.30	227.9	-2.3	4.47	9.55	186.2	2.38	10.7	5.3	8.57
44690.0	1981 MAR 26.5	1.00	185.5	0.0	5.0	2.2	5.45	185.1	1.30	228.6	-2.3	4.45	9.55	186.5	2.38	11.0	5.5	8.55
44700.0	1981 APR 5.5	1.00	195.3	0.0	14.1	6.0	5.45	185.8	1.30	229.4	-2.3	4.47	9.55	186.8	2.39	11.3	5.6	8.56
44710.0	1981 APR 15.5	1.00	205.1	0.0	23.3	9.7	5.45	186.6	1.30	230.2	-2.4	4.51	9.56	187.2	2.39	11.6	5.7	8.61
44720.0	1981 APR 25.5	1.01	214.9	0.0	32.6	13.2	5.45	187.3	1.30	230.9	-2.4	4.59	9.56	187.5	2.40	11.9	5.9	8.68
44730.0	1981 MAY 5.5	1.01	224.6	0.0	42.2	15.2	5.45	188.1	1.30	231.7	-2.4	4.68	9.56	187.8	2.40	12.2	6.0	8.77
44740.0	1981 MAY 15.5	1.01	234.3	0.0	51.9	13.9	5.45	188.8	1.31	232.4	-2.4	4.80	9.56	188.2	2.40	12.5	6.2	8.89

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
43900.0	1979 JAN 26.5	18.67	227.5	0.34	345.9	50.3	18.89	30.27	258.1	1.42	245.6	-26.6	30.94	30.22	197.1	17.15	153.1	0.0	29.94
43910.0	1979 FEB 5.5	18.67	227.6	0.34	345.9	50.4	18.72	30.27	258.1	1.42	245.6	-26.6	30.81	30.22	197.2	17.15	153.2	0.0	29.78
43920.0	1979 FEB 15.5	18.67	227.7	0.34	345.8	50.5	18.55	30.27	258.2	1.42	245.7	-26.6	30.66	30.22	197.3	17.15	153.2	0.0	29.64
43930.0	1979 FEB 25.5	18.67	227.9	0.34	345.7	50.7	18.39	30.27	258.2	1.42	245.7	-26.6	30.50	30.21	197.3	17.15	153.3	0.0	29.51
43940.0	1979 MAR 7.5	18.67	228.0	0.34	345.7	50.8	18.23	30.27	258.3	1.42	245.8	-26.6	30.33	30.21	197.4	17.15	153.4	0.0	29.41
43950.0	1979 MAR 17.5	18.67	228.1	0.34	345.6	60.9	18.08	30.27	258.4	1.42	245.9	-26.6	30.15	30.21	197.5	17.16	153.4	0.0	29.33
43960.0	1979 MAR 27.5	18.67	228.2	0.33	345.5	51.0	17.95	30.27	258.4	1.42	245.9	-26.7	29.98	30.21	197.5	17.16	153.5	0.0	29.27
43970.0	1979 APR 6.5	18.68	228.4	0.33	345.4	51.1	17.84	30.27	258.5	1.41	246.0	-26.7	29.82	30.20	197.6	17.16	153.6	0.0	29.25
43980.0	1979 APR 16.5	18.68	228.5	0.33	345.4	51.3	17.76	30.27	258.5	1.41	246.1	-26.7	29.68	30.20	197.7	17.16	153.6	0.0	29.25
43990.0	1979 APR 26.5	18.68	228.6	0.33	345.3	61.4	17.70	30.27	258.6	1.41	246.1	-26.7	29.54	30.20	197.7	17.16	153.7	0.0	29.28
44000.0	1979 MAY 6.5	18.68	228.7	0.33	345.2	61.5	17.67	30.27	258.7	1.41	246.2	-26.7	29.43	30.19	197.8	17.16	153.8	0.0	29.34
44010.0	1979 MAY 16.5	18.68	228.9	0.33	345.2	51.5	17.68	30.27	258.7	1.41	246.3	-26.7	29.35	30.19	197.9	17.16	153.8	0.0	29.42
44020.0	1979 MAY 26.5	18.68	229.0	0.32	345.1	61.7	17.71	30.27	258.8	1.41	246.3	-26.7	29.29	30.19	198.0	17.16	153.9	0.0	29.53
44030.0	1979 JUN 5.5	18.69	229.1	0.32	345.0	61.9	17.77	30.27	258.8	1.41	246.4	-26.7	29.26	30.18	198.0	17.16	153.9	0.0	29.65
44040.0	1979 JUN 15.5	18.69	229.2	0.32	344.9	62.0	17.86	30.27	258.9	1.41	246.5	-26.7	29.26	30.18	198.1	17.16	154.0	0.0	29.79
44050.0	1979 JUN 25.5	18.69	229.3	0.32	344.8	62.1	17.97	30.27	258.9	1.41	246.5	-26.8	29.28	30.18	198.2	17.16	154.1	0.0	29.94
44060.0	1979 JUL 5.5	18.69	229.5	0.32	344.8	62.2	18.10	30.27	259.0	1.40	246.6	-26.8	29.34	30.17	198.2	17.16	154.1	0.0	30.10
44070.0	1979 JUL 15.5	18.69	229.6	0.32	344.7	62.3	18.25	30.27	259.1	1.40	246.7	-26.8	29.42	30.17	198.3	17.16	154.2	0.0	30.25
44080.0	1979 JUL 25.5	18.69	229.7	0.32	344.6	62.4	18.40	30.27	259.1	1.40	246.7	-26.8	29.53	30.17	198.4	17.16	154.3	0.0	30.41
44090.0	1979 AUG 4.5	18.70	229.8	0.31	344.5	62.6	18.57	30.27	259.2	1.40	246.8	-26.8	29.66	30.16	198.4	17.16	154.3	0.0	30.56
44100.0	1979 AUG 14.5	18.70	230.0	0.31	344.5	62.7	18.74	30.27	259.2	1.40	246.8	-26.8	29.80	30.16	198.5	17.17	154.4	0.0	30.69
44110.0	1979 AUG 24.5	18.70	230.1	0.31	344.4	62.8	18.91	30.27	259.3	1.40	246.9	-26.8	29.96	30.16	198.6	17.17	154.5	0.0	30.81
44120.0	1979 SEP 3.5	18.70	230.2	0.31	344.3	62.9	19.07	30.27	259.4	1.40	247.0	-26.8	30.12	30.16	198.6	17.17	154.5	0.0	30.92
44130.0	1979 SEP 13.5	18.70	230.3	0.31	344.2	63.0	19.22	30.27	259.4	1.40	247.0	-26.8	30.29	30.15	198.7	17.17	154.6	0.0	31.00
44140.0	1979 SEP 23.5	18.70	230.5	0.31	344.1	63.1	19.35	30.27	259.5	1.40	247.1	-26.9	30.46	30.15	198.8	17.17	154.7	0.0	31.06
44150.0	1979 OCT 3.5	18.71	230.6	0.30	344.0	63.3	19.47	30.27	259.5	1.39	247.2	-26.9	30.62	30.15	198.9	17.17	154.7	0.0	31.09
44160.0	1979 OCT 13.5	18.71	230.7	0.30	344.0	63.4	19.57	30.27	259.6	1.39	247.2	-26.9	30.77	30.14	198.9	17.17	154.8	0.0	31.10
44170.0	1979 OCT 23.5	18.71	230.8	0.30	343.9	63.5	19.64	30.27	259.7	1.39	247.3	-26.9	30.91	30.14	199.0	17.17	154.9	0.0	31.08
44180.0	1979 NOV 2.5	18.71	231.0	0.30	343.8	63.6	19.68	30.27	259.7	1.39	247.4	-26.9	31.03	30.14	199.1	17.17	154.9	0.0	31.03
44190.0	1979 NOV 12.5	18.71	231.1	0.30	343.7	63.7	19.70	30.27	259.8	1.39	247.4	-26.9	31.12	30.13	199.1	17.17	155.0	0.0	30.96
44200.0	1979 NOV 22.5	18.71	231.2	0.30	343.6	63.8	19.69	30.27	259.8	1.39	247.5	-26.9	31.19	30.13	199.2	17.17	155.1	0.0	30.86
44210.0	1979 DEC 2.5	18.71	231.3	0.30	343.5	64.0	19.65	30.27	259.9	1.39	247.6	-26.9	31.24	30.13	199.3	17.17	155.1	0.0	30.74
44220.0	1979 DEC 12.5	18.72	231.4	0.29	343.4	64.1	19.59	30.27	260.0	1.39	247.6	-26.9	31.25	30.13	199.3	17.17	155.2	0.0	30.60
44230.0	1979 DEC 22.5	18.72	231.6	0.29	343.4	64.2	19.50	30.27	260.0	1.39	247.7	-27.0	31.24	30.12	199.4	17.17	155.3	0.0	30.45
44240.0	1980 JAN 1.5	18.72	231.7	0.29	343.3	64.3	19.39	30.27	260.1	1.38	247.8	-27.0	31.19	30.12	199.5	17.17	155.3	0.0	30.29
44250.0	1980 JAN 11.5	18.72	231.8	0.29	343.2	64.4	19.26	30.27	260.1	1.38	247.8	-27.0	31.12	30.12	199.5	17.17	155.4	0.0	30.12
44260.0	1980 JAN 21.5	18.72	231.9	0.29	343.1	64.5	19.11	30.27	260.2	1.38	247.9	-27.0	31.02	30.11	199.5	17.17	155.5	0.0	29.95
44270.0	1980 FEB 0.5	18.72	232.1	0.29	343.0	64.7	18.95	30.27	260.2	1.38	248.0	-27.0	30.90	30.11	199.7	17.17	155.5	0.0	29.79
44280.0	1980 FEB 10.5	18.73	232.2	0.28	342.9	64.8	18.78	30.27	260.3	1.38	248.0	-27.0	30.77	30.11	199.8	17.17	155.6	0.0	29.64
44290.0	1980 FEB 20.5	18.73	232.3	0.28	342.8	64.9	18.61	30.27	260.4	1.38	248.1	-27.0	30.61	30.11	199.8	17.17	155.7	0.0	29.50
44300.0	1980 MAR 1.5	18.73	232.4	0.28	342.7	65.0	18.44	30.27	260.4	1.38	248.1	-27.0	30.45	30.10	199.9	17.17	155.7	0.0	29.37
44310.0	1980 MAR 11.5	18.73	232.6	0.28	342.6	65.1	18.28	30.26	260.5	1.38	248.2	-27.0	30.28	30.10	200.0	17.17	155.8	0.0	29.28
44320.0	1980 MAR 21.5	18.73	232.7	0.28	342.5	65.2	18.14	30.26	260.5	1.37	248.3	-27.1	30.10	30.10	200.0	17.17	155.9	0.0	29.20
44330.0	1980 APR 0.5	18.73	232.8	0.28	342.4	65.4	18.01	30.26	260.6	1.37	248.3	-27.1	29.94	30.09	200.1	17.17	155.9	0.0	29.15
44340.0	1980 APR 10.5	18.74	232.9	0.28	342.3	65.5	17.90	30.26	260.7	1.37	248.4	-27.1	29.78	30.09	200.2	17.17	156.0	0.0	29.13
44350.0	1980 APR 20.5	18.74	233.0	0.27	342.2	65.6	17.82	30.26	260.7	1.37	248.5	-27.1	29.63	30.09	200.2	17.17	156.1	0.0	29.14
44360.0	1980 MAY 0.5	18.74	233.2	0.27	342.1	65.7	17.76	30.26	260.8	1.37	248.5	-27.1	29.51	30.08	200.3	17.17	156.1	0.0	29.18
44370.0	1980 MAY 10.5	18.74	233.3	0.27	342.0	65.8	17.73	30.26	260.8	1.37	248.6	-27.1	29.40	30.08	200.4	17.17	156.2	0.0	29.25
44380.0	1980 MAY 20.5	18.74	233.4	0.27	341.9	65.9	17.74	30.26	260.9	1.37	248.7	-27.1	29.33	30.08	200.4	17.17	156.3	0.0	29.33
44390.0	1980 MAY 30.5	18.74	233.5	0.27	341.8	66.1	17.77	30.26	261.0	1.37	248.7	-27.1	29.27	30.08	200.5	17.17	156.3	0.0	29.44
44400.0	1980 JUN 9.5	18.75	233.7	0.27	341.7	66.2	17.83	30.26	261.0	1.37	248.8	-27.1	29.25	30.07	200.6	17.17	156.4	0.0	29.57
44410.0	1980 JUN 19.5	18.75	233.8	0.26	341.6	66.3	17.92	30.26	261.1	1.36	248.9	-27.1	29.26	30.07	200.7	17.17	156.5	0.0	29.71
44420.0	1980 JUN 29.5	18.75	233.9	0.26	341.5	66.4	18.03	30.26	261.1	1.36	248.9	-27.2	29.29	30.07	200.7	17.17	156.5	0.0	29.86
44430.0	1980 JUL 9.5	18.75	234.0	0.26	341.4	66.5	18.16	30.26	261.2	1.36	249.0	-27.2	29.35	30.07	200.8	17.17	156.6	0.0	30.02
44440.0	1980 JUL 19.5	18.75	234.1	0.26	341.3	66.6	18.31	30.26	261.2	1.36	249.1	-27.2	29.44	30.06	200.9	17.17	156.7	0.0	30.18
44450.0	1980 JUL 29.5	18.75	234.3	0.26	341.2	66.8	18.47	30.26	261.3	1.36	249.1	-27.2	29.55	30.06	200.9	17.17	156.7	0.0	30.33
44460.0	1980 AUG 8.5	18.76	234.4	0.26	341.1	66.9	18.63	30.26	261.4	1.36	249.2	-27.2	29.68	30.06	201.0	17.17	156.8	0.0	30.48
44470.0	1980 AUG 18.5	18.76	234.5	0.26	341.0	67.0	18.80	30.26	261.4	1.36	249.3	-27.2	29.83	30.05	201.1	17.17	156.9	0.0	30.61
44480.0	1980 AUG 28.5	18.76	234.6	0.25	340.9	67.1	18.97	30.26	261.5	1.36	249.3	-27.2	29.99	30.05	201.1	17.17	156.9	0.0	30.73
44490.0	1980 SEP 7.5	18.76	234.8	0.25	340.8	67.2	19.13	30.26	261.5	1.35	249.4	-27.2	30.16	30.05	201.2	17.17	157.0	0.0	30.83
44500.0	1980 SEP 17.5	18.76	234.9	0.25	340.6	67.3	19.28	30.26	261.6	1.35	249.5	-27.2	30.33	30.05	201.3	17.17	157.1	0.0	30.91
44510.0	1980 SEP 27.5	18.76	235.0	0.25	340.5	67.4	19.41	30.26	261.7	1.35	249.5	-27.2	30.50	30.04	201.3	17.16	157.1	0.0	30.96
44520.0	1980 OCT 7.5	18.77	235.1	0.25	340.4	67.6	19.53	30.26	261.7	1.35	249.6	-27.3	30.66	30.04	201.4	17.16	157.2	0.0	30.99
44530.0	1980 OCT 17.5	18.77	235.2	0.25	340.3	67.7	19.63	30.26	261.8	1.35	249.6	-27.3	30.80	30.04	201.5	17.16	157.3	0.0	30.99
44540.0	1980 OCT 27.5	18.77	235.4	0.24	340.2	67.8	19.70	30.26	261.8	1.35	249.7	-27.3	30.94	30.03	201.6	17.16	157.3	0.0	30.96
44550.0	1980 NOV 6.5	18.77	235.5	0.24	340.1	67.9	19.74	30.26	261.9	1.35	249.8	-27.3	31.05	30.03	201.6	17.16	157.4	0.0	30.91
44560.0	1980 NOV 16.5	18.77	235.6	0.24	339.9	68.0	19.76	30.26	262.0	1.35	249.8	-27.3	31.14	30.03	201.7	17.16	157.5	0.0	30.83
44570.0	1980 NOV 26.5	18.77	235.7	0.24	339.8	68.1	19.75	30.26	262.0	1.35	249.9	-27.3	31.20	30.03	201.8	17.16	157.5	0.0	30.73
44580.0	1980 DEC 6.5	18.78	235.9	0.24	339.7	68.2	19.71	30.26	262.1	1.34	250.0	-27.3	31.24	30.02	201.8	17.16	157.6	0.0	30.61
44590.0	1980 DEC 16.5	18.78	236.0	0.24	339.6	68.4	19.65	30.26	262.1	1.34	250.0	-27.3	31.24	30.02	201.9	17.16	157.7	0.0	30.47
44600.0	1980 DEC 26.5	18.78	236.1	0.23	339.5	68.5	19.56	30.26	262.2	1.34	250.1	-27.3	31.22	30.02	202.0	17.16	157.7	0.0	30.31
44610.0	1981 JAN 5.5	18.78	236.2	0.23	339.3	68.6	19.45	30.26	262.3	1.34	250.2	-27.3	31.17	30.02	202.0	17.16	157.8	0.0	30.15
44620.0	1981 JAN 15.5	18.78	236.4	0.23	339.2	68.7	19.31	30.26	262.3	1.34	250.2	-27.4	31.09	30.01	202.1	17.16	157.9	0.0	29.98
44630.0	1981 JAN 25.5	18.78	236.5	0.23	339.1	68.8	19.16	30.26	262.4	1.34	250.3	-27.4	30.99	30.01	202.2	17.16	157.9	0.0	29.81
44640.0	1981 FEB 4.5	18.79	236.6	0.23	339.0	68.9	19.00	30.26	262.4	1.34	250.4	-27.4	30.86	30.01	202.2	17.16	158.0	0.0	29.65
44650.0	1981 FEB 14.5	18.79	236.7	0.23	338.8	69.0	18.84	30.26	262.5	1.34	250.4	-27.4	30.72	30.00	202.3	17.16	158.1	0.0	29.50
44660.0	1981 FEB 24.5	18.79	236.8	0.23	338.7	69.1	18.67	30.26	262.5	1.33	250.5	-27.4	30.56	30.00	202.4	17.15	158.1	0.0	29.37
44670.0	1981 MAR 6.5	18.79	237.0	0.22	338.6	69.3	18.50	30.26	262.6	1.33	250.6	-27.4	30.40	30.00	202.5	17.15	158.2	0.0	29.25
44680.0	1981 MAR 16.5	18.79	237.1	0.22	338.4	69.4	18.34	30.26	262.7	1.33	250.6	-27.4	30.23	30.00	202.5	17.15	158.3	0.0	29.15
44690.0	1981 MAR 26.5	18.80	237.2	0.22	338.3	69.5	18.19	30.26	262.7	1.33	250.7	-27.4	30.05	29.99	202.6	17.15	158.3	0.0	29.09
44700.0	1981 APR 5.5	18.80	237.3	0.22	338.2	69.6	18.07	30.26	262.8	1.33	250.8	-27.4	29.89	29.99	202.7	17.15	158.4	0.0	29.05
44710.0	1981 APR 15.5	18.80	237.4	0.22	338.0	69.7	17.96	30.26	262.8	1.33	250.8	-27.4	29.73	29.99	202.7	17.15	158.5	0.0	29.03
44720.0	1981 APR 25.5	18.80	237.6	0.22	337.9	69.8	17.88	30.26	262.9	1.33	250.9	-27.5	29.59	29.99	202.8	17.15	158.5	0.0	29.05
44730.0	1981 MAY 5.5	18.80	237.7	0.21	337.7	69.9	17.82	30.26	263.0	1.33	251.0	-27.5	29.47	29.98	202.9	17.15	158.6	0.0	29.09
44740.0	1981 MAY 15.5	18.80	237.8	0.21	337.6	70.0	17.79	30.26	263.0	1.32	251.0	-27.5	29.38	29.98	202.9	17.15	158.7	0.0	29.15

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
44750.0	1981 MAY 25.5	1.01	243.9	0.0	61.9	20.9	5.45	189.6	1.31	233.2	-2.5	4.93	9.57	188.5	2.41	12.8	6.3	9.03
44760.0	1981 JUN 4.5	1.01	253.5	0.0	72.1	22.4	5.45	190.4	1.31	233.9	-2.5	5.08	9.57	188.8	2.41	13.1	6.5	9.18
44770.0	1981 JUN 14.5	1.02	263.0	0.0	82.4	23.3	5.45	191.1	1.31	234.7	-2.5	5.23	9.57	189.2	2.41	13.4	6.6	9.34
44780.0	1981 JUN 24.5	1.02	272.6	0.0	92.8	23.4	5.45	191.9	1.30	235.4	-2.5	5.39	9.58	189.5	2.42	13.7	6.8	9.51
44790.0	1981 JUL 4.5	1.02	282.1	0.0	103.2	22.9	5.45	192.6	1.30	236.2	-2.5	5.54	9.58	189.8	2.42	14.0	6.9	9.67
44800.0	1981 JUL 14.5	1.02	291.7	0.0	113.4	21.7	5.45	193.4	1.30	237.0	-2.6	5.69	9.58	190.2	2.42	14.3	7.0	9.84
44810.0	1981 JUL 24.5	1.02	301.2	0.0	123.4	19.9	5.45	194.1	1.30	237.7	-2.6	5.83	9.59	190.5	2.43	14.6	7.2	9.99
44820.0	1981 AUG 3.5	1.01	310.8	0.0	133.2	17.5	5.45	194.9	1.30	238.5	-2.6	5.97	9.59	190.8	2.43	14.9	7.3	10.13
44830.0	1981 AUG 13.5	1.01	320.3	0.0	142.8	14.7	5.45	195.6	1.30	239.2	-2.6	6.09	9.59	191.2	2.43	15.2	7.5	10.26
44840.0	1981 AUG 23.5	1.01	330.0	0.0	152.1	11.5	5.45	196.4	1.30	240.0	-2.7	6.19	9.60	191.5	2.44	15.5	7.6	10.37
44850.0	1981 SEP 2.5	1.01	339.6	0.0	161.2	8.0	5.45	197.2	1.30	240.7	-2.7	6.28	9.60	191.8	2.44	15.8	7.8	10.46
44860.0	1981 SEP 12.5	1.01	349.3	0.0	170.2	4.2	5.45	197.9	1.29	241.5	-2.7	6.36	9.60	192.2	2.44	16.1	7.9	10.54
44870.0	1981 SEP 22.5	1.00	359.1	0.0	179.2	0.4	5.45	198.7	1.29	242.2	-2.7	6.41	9.60	192.5	2.45	16.4	8.0	10.58
44880.0	1981 OCT 2.5	1.00	8.9	0.0	188.2	-3.5	5.45	199.4	1.29	243.0	-2.7	6.44	9.61	192.8	2.45	16.7	8.2	10.61
44890.0	1981 OCT 12.5	1.00	18.8	0.0	197.3	-7.4	5.45	200.2	1.29	243.8	-2.8	6.45	9.61	193.1	2.45	17.0	8.3	10.60
44900.0	1981 OCT 22.5	1.00	28.7	0.0	206.7	-11.0	5.45	200.9	1.28	244.5	-2.8	6.44	9.61	193.5	2.45	17.3	8.5	10.58
44910.0	1981 NOV 1.5	0.99	38.7	0.0	216.3	-14.4	5.45	201.7	1.28	245.3	-2.8	6.41	9.62	193.8	2.46	17.6	8.6	10.52
44920.0	1981 NOV 11.5	0.99	48.7	0.0	226.3	-17.4	5.45	202.4	1.27	246.0	-2.8	6.35	9.62	194.1	2.46	17.9	8.7	10.45
44930.0	1981 NOV 21.5	0.99	58.8	0.0	236.6	-19.9	5.45	203.2	1.27	246.8	-2.8	6.28	9.62	194.5	2.46	18.2	8.9	10.35
44940.0	1981 DEC 1.5	0.99	68.9	0.0	247.2	-21.8	5.45	204.0	1.27	247.5	-2.8	6.19	9.63	194.8	2.46	18.5	9.0	10.23
44950.0	1981 DEC 11.5	0.98	79.1	0.0	258.1	-23.0	5.45	204.7	1.26	248.3	-2.9	6.08	9.63	195.1	2.46	18.8	9.2	10.10
44960.0	1981 DEC 21.5	0.98	89.2	0.0	269.2	-23.4	5.45	205.5	1.26	249.1	-2.9	5.95	9.63	195.4	2.47	19.1	9.3	9.95
44970.0	1982 JAN 0.5	0.98	99.4	0.0	280.3	-23.1	5.45	206.2	1.25	249.8	-2.9	5.81	9.63	195.8	2.47	19.4	9.4	9.79
44980.0	1982 JAN 10.5	0.98	109.6	0.0	291.3	-22.3	5.45	207.0	1.25	250.6	-2.9	5.66	9.64	196.1	2.47	19.7	9.6	9.63
44990.0	1982 JAN 20.5	0.98	119.8	0.0	302.0	-20.2	5.45	207.7	1.24	251.3	-2.9	5.50	9.64	196.4	2.47	20.0	9.7	9.46
45000.0	1982 JAN 30.5	0.99	130.0	0.0	312.4	-17.7	5.45	208.5	1.24	252.1	-2.9	5.34	9.64	196.8	2.47	20.3	9.9	9.30
45010.0	1982 FEB 9.5	0.99	140.1	0.0	322.5	-14.8	5.44	209.3	1.23	252.8	-2.9	5.18	9.65	197.1	2.48	20.6	10.0	9.15
45020.0	1982 FEB 19.5	0.99	150.2	0.0	332.3	-11.4	5.44	210.0	1.23	253.6	-2.9	5.02	9.65	197.4	2.48	20.9	10.1	9.01
45030.0	1982 MAR 1.5	0.99	160.3	0.0	341.8	-7.7	5.44	210.8	1.22	254.4	-3.0	4.87	9.65	197.7	2.48	21.2	10.3	8.89
45040.0	1982 MAR 11.5	0.99	170.3	0.0	351.1	-3.8	5.44	211.5	1.21	255.1	-3.0	4.74	9.66	198.1	2.48	21.5	10.4	8.79
45050.0	1982 MAR 21.5	1.00	180.2	0.0	0.2	0.1	5.44	212.3	1.21	255.9	-3.0	4.63	9.66	198.4	2.48	21.8	10.5	8.72
45060.0	1982 APR 0.5	1.00	190.1	0.0	9.3	4.0	5.44	213.0	1.20	256.6	-3.0	4.54	9.66	198.7	2.48	22.1	10.7	8.68
45070.0	1982 APR 10.5	1.00	200.0	0.0	18.5	7.8	5.44	213.8	1.19	257.4	-3.0	4.47	9.66	199.0	2.48	22.4	10.8	8.66
45080.0	1982 APR 20.5	1.00	209.8	0.0	27.7	11.4	5.44	214.6	1.19	258.2	-3.0	4.44	9.67	199.4	2.48	22.7	10.9	8.68
45090.0	1982 MAY 0.5	1.01	219.5	0.0	37.1	14.7	5.44	215.3	1.18	258.9	-3.0	4.43	9.67	199.7	2.48	23.0	11.1	8.73
45100.0	1982 MAY 10.5	1.01	229.2	0.0	46.8	17.5	5.43	216.1	1.17	259.7	-3.0	4.46	9.67	200.0	2.49	23.3	11.2	8.81
45110.0	1982 MAY 20.5	1.01	238.8	0.0	56.6	19.9	5.43	216.8	1.17	260.5	-3.0	4.51	9.68	200.3	2.49	23.6	11.3	8.91
45120.0	1982 MAY 30.5	1.01	248.4	0.0	66.7	21.7	5.43	217.6	1.16	261.2	-3.0	4.59	9.68	200.7	2.49	23.9	11.5	9.03
45130.0	1982 JUN 9.5	1.02	258.0	0.0	77.0	22.9	5.43	218.4	1.15	262.0	-3.0	4.69	9.68	201.0	2.49	24.3	11.6	9.17
45140.0	1982 JUN 19.5	1.02	267.6	0.0	87.4	23.4	5.43	219.1	1.14	262.7	-3.0	4.81	9.69	201.3	2.49	24.6	11.7	9.32
45150.0	1982 JUN 29.5	1.02	277.1	0.0	97.8	23.3	5.43	219.9	1.13	263.5	-3.0	4.95	9.69	201.6	2.49	24.9	11.9	9.48
45160.0	1982 JUL 9.5	1.02	286.6	0.0	108.1	22.4	5.42	220.7	1.12	264.3	-3.1	5.10	9.69	202.0	2.49	25.2	12.0	9.65
45170.0	1982 JUL 19.5	1.02	296.2	0.0	118.2	20.9	5.42	221.4	1.11	265.0	-3.1	5.25	9.69	202.3	2.49	25.5	12.1	9.82
45180.0	1982 JUL 29.5	1.02	305.7	0.0	128.1	18.8	5.42	222.2	1.11	265.8	-3.1	5.40	9.70	202.6	2.49	25.8	12.3	9.98
45190.0	1982 AUG 8.5	1.01	315.3	0.0	137.8	15.2	5.42	223.0	1.10	266.6	-3.1	5.55	9.70	202.9	2.49	26.1	12.4	10.13
45200.0	1982 AUG 18.5	1.01	324.9	0.0	147.2	13.2	5.42	223.7	1.09	267.3	-3.1	5.70	9.70	203.3	2.49	26.4	12.5	10.27
45210.0	1982 AUG 28.5	1.01	334.5	0.0	156.4	9.8	5.42	224.5	1.08	268.1	-3.1	5.84	9.71	203.6	2.49	26.7	12.6	10.40
45220.0	1982 SEP 7.5	1.01	344.2	0.0	165.5	6.2	5.41	225.3	1.07	268.9	-3.1	5.97	9.71	203.9	2.49	27.0	12.8	10.50
45230.0	1982 SEP 17.5	1.00	354.0	0.0	174.5	2.4	5.41	226.0	1.06	269.6	-3.1	6.08	9.71	204.2	2.49	27.3	12.9	10.59
45240.0	1982 SEP 27.5	1.00	3.7	0.0	183.5	-1.5	5.41	226.8	1.05	270.4	-3.1	6.18	9.71	204.6	2.49	27.6	13.0	10.66
45250.0	1982 OCT 7.5	1.00	13.6	0.0	192.5	-5.4	5.41	227.6	1.04	271.2	-3.1	6.26	9.72	204.9	2.49	27.9	13.2	10.70
45260.0	1982 OCT 17.5	1.00	23.5	0.0	201.7	-9.1	5.41	228.3	1.02	271.9	-3.1	6.32	9.72	205.2	2.49	28.2	13.3	10.72
45270.0	1982 OCT 27.5	0.99	33.4	0.0	211.2	-12.7	5.40	229.1	1.01	272.7	-3.1	6.37	9.72	205.5	2.49	28.5	13.4	10.71
45280.0	1982 NOV 6.5	0.99	43.4	0.0	221.0	-15.9	5.40	229.9	1.00	273.5	-3.1	6.39	9.73	205.8	2.49	28.8	13.5	10.67
45290.0	1982 NOV 16.5	0.99	53.5	0.0	231.1	-18.7	5.40	230.6	0.99	274.3	-3.1	6.39	9.73	206.2	2.49	29.1	13.7	10.62
45300.0	1982 NOV 26.5	0.99	63.6	0.0	241.6	-20.9	5.40	231.4	0.98	275.0	-3.1	6.37	9.73	206.5	2.49	29.4	13.8	10.53
45310.0	1982 DEC 6.5	0.99	73.7	0.0	252.4	-22.5	5.40	232.2	0.97	275.8	-3.1	6.32	9.73	206.8	2.49	29.7	13.9	10.43
45320.0	1982 DEC 16.5	0.98	83.9	0.0	263.4	-23.3	5.39	232.9	0.96	276.6	-3.0	6.26	9.74	207.1	2.48	30.0	14.0	10.31
45330.0	1982 DEC 26.5	0.98	94.1	0.0	274.5	-23.4	5.39	233.7	0.94	277.3	-3.0	6.17	9.74	207.4	2.48	30.3	14.2	10.17
45340.0	1983 JAN 5.5	0.98	104.3	0.0	285.5	-22.7	5.39	234.5	0.93	278.1	-3.0	6.07	9.74	207.8	2.48	30.6	14.3	10.02
45350.0	1983 JAN 15.5	0.98	114.5	0.0	296.4	-21.2	5.39	235.3	0.92	278.9	-3.0	5.95	9.75	208.1	2.48	30.9	14.4	9.86
45360.0	1983 JAN 25.5	0.98	124.6	0.0	307.0	-19.1	5.38	236.0	0.91	279.7	-3.0	5.82	9.75	208.4	2.48	31.2	14.5	9.69
45370.0	1983 FEB 4.5	0.99	134.8	0.0	317.3	-16.4	5.38	236.8	0.89	280.4	-3.0	5.67	9.75	208.7	2.48	31.5	14.7	9.53
45380.0	1983 FEB 14.5	0.99	144.9	0.0	327.2	-13.2	5.38	237.6	0.88	281.2	-3.0	5.51	9.75	209.0	2.48	31.8	14.8	9.37
45390.0	1983 FEB 24.5	0.99	155.0	0.0	336.9	-9.7	5.38	238.4	0.87	282.0	-3.0	5.35	9.76	209.4	2.48	32.2	14.9	9.22
45400.0	1983 MAR 6.5	0.99	165.0	0.0	346.2	-5.9	5.37	239.1	0.85	282.8	-3.0	5.19	9.76	209.7	2.47	32.5	15.0	9.08
45410.0	1983 MAR 16.5	0.99	175.0	0.0	355.4	-2.0	5.37	239.9	0.84	283.6	-3.0	5.03	9.76	210.0	2.47	32.8	15.1	8.97
45420.0	1983 MAR 26.5	1.00	185.0	0.0	4.6	2.0	5.37	240.7	0.83	284.3	-3.0	4.88	9.76	210.3	2.47	33.1	15.3	8.87
45430.0	1983 APR 5.5	1.00	194.8	0.0	13.7	5.9	5.37	241.5	0.81	285.1	-3.0	4.73	9.77	210.6	2.47	33.4	15.4	8.81
45440.0	1983 APR 15.5	1.00	204.6	0.0	22.8	9.6	5.36	242.3	0.80	285.9	-2.9	4.61	9.77	211.0	2.47	33.7	15.5	8.77
45450.0	1983 APR 25.5	1.01	214.4	0.0	32.2	13.0	5.36	243.0	0.79	286.7	-2.9	4.50	9.77	211.3	2.47	34.0	15.6	8.77
45460.0	1983 MAY 5.5	1.01	224.1	0.0	41.7	15.1	5.35	243.8	0.77	287.5	-2.9	4.42	9.78	211.6	2.46	34.3	15.7	8.79
45470.0	1983 MAY 15.5	1.01	233.8	0.0	51.4	18.7	5.35	244.6	0.76	288.3	-2.9	4.37	9.78	211.9	2.46	34.6	15.8	8.85
45480.0	1983 MAY 25.5	1.01	243.4	0.0	61.4	20.8	5.35	245.4	0.74	289.0	-2.9	4.34	9.78	212.2	2.46	34.9	16.0	8.93
45490.0	1983 JUN 4.5	1.01	253.0	0.0	71.6	22.4	5.35	246.2	0.73	289.8	-2.9	4.34	9.78	212.6	2.46	35.2	16.1	9.04
45500.0	1983 JUN 14.5	1.02	262.6	0.0	81.9	23.2	5.35	247.0	0.71	290.6	-2.9	4.38	9.79	212.9	2.46	35.5	16.2	9.16
45510.0	1983 JUN 24.5	1.02	272.1	0.0	92.3	23.4	5.34	247.8	0.70	291.4	-2.9	4.44	9.79	213.2	2.45	35.8	16.3	9.31
45520.0	1983 JUL 4.5	1.02	281.6	0.0	102.7	22.9	5.34	248.5	0.68	292.2	-2.8	4.52	9.79	213.5	2.45	36.1	16.4	9.46
45530.0	1983 JUL 14.5	1.02	291.2	0.0	112.9	21.8	5.34	249.3	0.67	293.0	-2.8	4.63	9.79	213.8	2.45	36.5	16.5	9.62
45540.0	1983 JUL 24.5	1.02	300.7	0.0	122.9	20.3	5.33	250.1	0.65	293.8	-2.8	4.75	9.80	214.1	2.45	36.8	16.7	9.79
45550.0	1983 AUG 3.5	1.01	310.3	0.0	132.7	17.7	5.33	250.9	0.64	294.6	-2.8	4.89	9.80	214.5	2.44	37.1	16.8	9.95
45560.0	1983 AUG 13.5	1.01	319.9	0.0	142.3	14.9	5.33	251.7	0.62	295.3	-2.8	5.04	9.80	214.8	2.44	37.4	16.9	10.11
45570.0	1983 AUG 23.5	1.01	329.5	0.0	151.6	11.7	5.32	252.5	0.60	296.1	-2.8	5.19	9.81	215.1	2.44	37.7	17.0	10.26
45580.0	1983 SEP 2.5	1.01	339.1	0.0	160.7	8.1	5.32	253.3	0.59	296.9	-2.7	5.34	9.81	215.4	2.43	38.0	17.1	10.40
45590.0	1983 SEP 12.5	1.01	348.8	0.0	169.8	4.4	5.32	254.1	0.57	297.7	-2.7	5.49	9.81	215.7	2.43	38.3	17.2	10.52

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
44750.0	1981 MAY 25.5	18.81	237.9	0.21	337.4	70.2	17.80	30.26	263.1	1.32	251.1	-27.5	29.30	29.98	203.0	17.15	158.7	0.0	29.26
44760.0	1981 JUN 4.5	18.81	238.1	0.21	337.3	70.3	17.83	30.26	263.1	1.32	251.2	-27.5	29.26	29.98	203.1	17.14	158.8	0.0	29.37
44770.0	1981 JUN 14.5	18.81	238.2	0.21	337.2	70.4	17.89	30.26	263.2	1.32	251.2	-27.5	29.24	29.97	203.2	17.14	158.9	0.0	29.50
44780.0	1981 JUN 24.5	18.81	238.3	0.21	337.0	70.5	17.98	30.26	263.3	1.32	251.3	-27.5	29.25	29.97	203.2	17.14	158.9	0.0	29.64
44790.0	1981 JUL 4.5	18.81	238.4	0.20	336.9	70.5	18.09	30.26	263.3	1.32	251.4	-27.5	29.30	29.97	203.3	17.14	159.0	0.0	29.80
44800.0	1981 JUL 14.5	18.81	238.5	0.20	336.7	70.7	18.22	30.26	263.4	1.32	251.4	-27.5	29.37	29.97	203.4	17.14	159.1	0.0	29.95
44810.0	1981 JUL 24.5	18.82	238.7	0.20	336.5	70.8	18.37	30.26	263.4	1.32	251.5	-27.5	29.46	29.96	203.4	17.14	159.1	0.0	30.11
44820.0	1981 AUG 3.5	18.82	238.8	0.20	336.4	70.9	18.53	30.26	263.5	1.32	251.6	-27.5	29.58	29.96	203.5	17.14	159.2	0.0	30.26
44830.0	1981 AUG 13.5	18.82	238.9	0.20	336.2	71.0	18.70	30.26	263.5	1.31	251.6	-27.6	29.71	29.96	203.6	17.14	159.3	0.0	30.41
44840.0	1981 AUG 23.5	18.82	239.0	0.20	336.1	71.1	18.86	30.26	263.6	1.31	251.7	-27.6	29.87	29.96	203.6	17.14	159.3	0.0	30.54
44850.0	1981 SEP 2.5	18.82	239.2	0.20	335.9	71.3	19.03	30.26	263.7	1.31	251.7	-27.6	30.03	29.95	203.7	17.13	159.4	0.0	30.65
44860.0	1981 SEP 12.5	18.82	239.3	0.19	335.8	71.4	19.19	30.26	263.7	1.31	251.8	-27.6	30.20	29.95	203.8	17.13	159.5	0.0	30.75
44870.0	1981 SEP 22.5	18.83	239.4	0.19	335.6	71.5	19.34	30.26	263.8	1.31	251.9	-27.6	30.36	29.95	203.9	17.13	159.5	0.0	30.82
44880.0	1981 OCT 2.5	18.83	239.5	0.19	335.4	71.6	19.48	30.26	263.8	1.31	251.9	-27.6	30.53	29.95	203.9	17.13	159.6	0.0	30.87
44890.0	1981 OCT 12.5	18.83	239.6	0.19	335.3	71.7	19.60	30.26	263.9	1.31	252.0	-27.6	30.69	29.94	204.0	17.13	159.7	0.0	30.89
44900.0	1981 OCT 22.5	18.83	239.8	0.19	335.1	71.8	19.69	30.26	264.0	1.31	252.1	-27.6	30.83	29.94	204.1	17.13	159.7	0.0	30.89
44910.0	1981 NOV 1.5	18.83	239.9	0.19	334.9	71.9	19.76	30.25	264.0	1.30	252.1	-27.6	30.96	29.94	204.1	17.13	159.8	0.0	30.86
44920.0	1981 NOV 11.5	18.83	240.0	0.18	334.7	72.0	19.81	30.25	264.1	1.30	252.2	-27.6	31.07	29.94	204.2	17.12	159.9	0.0	30.80
44930.0	1981 NOV 21.5	18.84	240.1	0.18	334.6	72.1	19.82	30.25	264.1	1.30	252.3	-27.6	31.15	29.93	204.3	17.12	159.9	0.0	30.72
44940.0	1981 DEC 1.5	18.84	240.2	0.18	334.4	72.2	19.81	30.25	264.2	1.30	252.3	-27.6	31.21	29.93	204.3	17.12	160.0	0.0	30.61
44950.0	1981 DEC 11.5	18.84	240.4	0.18	334.2	72.4	19.78	30.25	264.3	1.30	252.4	-27.7	31.23	29.93	204.4	17.12	160.1	0.0	30.48
44960.0	1981 DEC 21.5	18.84	240.5	0.18	334.0	72.5	19.71	30.25	264.3	1.30	252.5	-27.7	31.23	29.93	204.5	17.12	160.1	0.0	30.34
44970.0	1982 JAN 0.5	18.84	240.6	0.18	333.8	72.6	19.62	30.25	264.4	1.30	252.5	-27.7	31.20	29.92	204.6	17.12	160.2	0.0	30.18
44980.0	1982 JAN 10.5	18.85	240.7	0.17	333.6	72.7	19.51	30.25	264.4	1.30	252.6	-27.7	31.15	29.92	204.6	17.11	160.3	0.0	30.02
44990.0	1982 JAN 20.5	18.85	240.9	0.17	333.5	72.8	19.37	30.25	264.5	1.29	252.7	-27.7	31.06	29.92	204.7	17.11	160.3	0.0	29.85
45000.0	1982 JAN 30.5	18.85	241.0	0.17	333.3	72.9	19.22	30.25	264.6	1.29	252.7	-27.7	30.95	29.92	204.8	17.11	160.4	0.0	29.69
45010.0	1982 FEB 9.5	18.85	241.1	0.17	333.1	73.0	19.06	30.25	264.6	1.29	252.8	-27.7	30.82	29.91	204.8	17.11	160.5	0.0	29.53
45020.0	1982 FEB 19.5	18.85	241.2	0.17	332.9	73.1	18.90	30.25	264.7	1.29	252.9	-27.7	30.68	29.91	204.9	17.11	160.5	0.0	29.38
45030.0	1982 MAR 1.5	18.85	241.3	0.17	332.7	73.2	18.73	30.25	264.7	1.29	252.9	-27.7	30.52	29.91	205.0	17.11	160.6	0.0	29.25
45040.0	1982 MAR 11.5	18.86	241.5	0.17	332.5	73.3	18.56	30.25	264.8	1.29	253.0	-27.7	30.35	29.91	205.0	17.10	160.7	0.0	29.13
45050.0	1982 MAR 21.5	18.86	241.6	0.16	332.3	73.4	18.40	30.25	264.8	1.29	253.1	-27.7	30.18	29.91	205.1	17.10	160.7	0.0	29.05
45060.0	1982 APR 0.5	18.86	241.7	0.16	332.1	73.5	18.26	30.25	264.9	1.29	253.1	-27.7	30.01	29.90	205.2	17.10	160.8	0.0	28.98
45070.0	1982 APR 10.5	18.86	241.8	0.16	331.9	73.6	18.13	30.25	265.0	1.28	253.2	-27.8	29.84	29.90	205.3	17.10	160.9	0.0	28.95
45080.0	1982 APR 20.5	18.86	241.9	0.16	331.7	73.7	18.02	30.25	265.0	1.28	253.3	-27.8	29.69	29.90	205.3	17.10	160.9	0.0	28.94
45090.0	1982 MAY 0.5	18.86	242.1	0.16	331.4	73.8	17.94	30.25	265.1	1.28	253.3	-27.8	29.56	29.90	205.4	17.10	161.0	0.0	28.96
45100.0	1982 MAY 10.5	18.87	242.2	0.16	331.2	74.0	17.88	30.25	265.1	1.28	253.4	-27.8	29.44	29.89	205.5	17.09	161.1	0.0	29.01
45110.0	1982 MAY 20.5	18.87	242.3	0.15	331.0	74.1	17.86	30.25	265.2	1.28	253.5	-27.8	29.35	29.89	205.5	17.09	161.1	0.0	29.09
45120.0	1982 MAY 30.5	18.87	242.4	0.15	330.8	74.2	17.86	30.25	265.3	1.28	253.5	-27.8	29.28	29.89	205.6	17.09	161.2	0.0	29.19
45130.0	1982 JUN 9.5	18.87	242.6	0.15	330.6	74.3	17.90	30.25	265.3	1.28	253.6	-27.8	29.24	29.89	205.7	17.09	161.3	0.0	29.31
45140.0	1982 JUN 19.5	18.87	242.7	0.15	330.3	74.4	17.96	30.25	265.4	1.28	253.7	-27.8	29.24	29.88	205.7	17.09	161.3	0.0	29.44
45150.0	1982 JUN 29.5	18.88	242.8	0.15	330.1	74.5	18.04	30.25	265.4	1.27	253.7	-27.8	29.26	29.88	205.8	17.08	161.4	0.0	29.59
45160.0	1982 JUL 9.5	18.88	242.9	0.15	329.9	74.6	18.15	30.25	265.5	1.27	253.8	-27.8	29.30	29.88	205.9	17.08	161.5	0.0	29.74
45170.0	1982 JUL 19.5	18.88	243.0	0.14	329.6	74.7	18.29	30.25	265.6	1.27	253.9	-27.8	29.38	29.88	206.0	17.08	161.5	0.0	29.90
45180.0	1982 JUL 29.5	18.88	243.2	0.14	329.4	74.8	18.44	30.25	265.6	1.27	253.9	-27.8	29.48	29.88	206.0	17.08	161.6	0.0	30.06
45190.0	1982 AUG 8.5	18.88	243.3	0.14	329.1	74.9	18.59	30.25	265.7	1.27	254.0	-27.9	29.60	29.87	206.1	17.07	161.7	0.0	30.21
45200.0	1982 AUG 18.5	18.88	243.4	0.14	328.9	75.0	18.76	30.25	265.7	1.27	254.1	-27.9	29.74	29.87	206.2	17.07	161.7	0.0	30.35
45210.0	1982 AUG 28.5	18.89	243.5	0.14	328.7	75.1	18.93	30.25	265.8	1.27	254.1	-27.9	29.90	29.87	206.2	17.07	161.8	0.0	30.48
45220.0	1982 SEP 7.5	18.89	243.6	0.14	328.4	75.2	19.10	30.25	265.9	1.27	254.2	-27.9	30.06	29.87	206.3	17.07	161.9	0.0	30.59
45230.0	1982 SEP 17.5	18.89	243.8	0.13	328.1	75.3	19.26	30.25	265.9	1.26	254.3	-27.9	30.23	29.86	206.4	17.07	161.9	0.0	30.68
45240.0	1982 SEP 27.5	18.89	243.9	0.13	327.9	75.4	19.41	30.25	266.0	1.26	254.3	-27.9	30.40	29.86	206.4	17.06	162.0	0.0	30.75
45250.0	1982 OCT 7.5	18.89	244.0	0.13	327.6	75.5	19.55	30.25	266.0	1.26	254.4	-27.9	30.57	29.86	206.5	17.06	162.1	0.0	30.79
45260.0	1982 OCT 17.5	18.89	244.1	0.13	327.4	75.6	19.69	30.25	266.1	1.26	254.5	-27.9	30.72	29.86	206.6	17.06	162.1	0.0	30.81
45270.0	1982 OCT 27.5	18.90	244.2	0.13	327.1	75.7	19.76	30.25	266.1	1.26	254.5	-27.9	30.86	29.86	206.7	17.06	162.2	0.0	30.80
45280.0	1982 NOV 6.5	18.90	244.4	0.13	326.8	75.8	19.83	30.25	266.2	1.26	254.6	-27.9	30.98	29.85	206.7	17.05	162.3	0.0	30.76
45290.0	1982 NOV 16.5	18.90	244.5	0.13	326.5	75.9	19.87	30.25	266.3	1.26	254.7	-27.9	31.08	29.85	206.8	17.05	162.3	0.0	30.70
45300.0	1982 NOV 26.5	18.90	244.6	0.12	326.3	76.0	19.89	30.25	266.3	1.25	254.7	-27.9	31.16	29.85	206.9	17.05	162.4	0.0	30.61
45310.0	1982 DEC 6.5	18.90	244.7	0.12	326.0	76.1	19.88	30.25	266.4	1.25	254.8	-27.9	31.21	29.85	206.9	17.05	162.5	0.0	30.50
45320.0	1982 DEC 16.5	18.91	244.9	0.12	325.7	76.2	19.84	30.25	266.4	1.25	254.9	-28.0	31.23	29.84	207.0	17.05	162.5	0.0	30.37
45330.0	1982 DEC 26.5	18.91	245.0	0.12	325.4	76.3	19.77	30.25	266.5	1.25	254.9	-28.0	31.22	29.84	207.1	17.04	162.6	0.0	30.22
45340.0	1983 JAN 5.5	18.91	245.1	0.12	325.1	76.4	19.68	30.25	266.6	1.25	255.0	-28.0	31.19	29.84	207.2	17.04	162.7	0.0	30.07
45350.0	1983 JAN 15.5	18.91	245.2	0.12	324.8	76.5	19.57	30.25	266.6	1.25	255.1	-28.0	31.12	29.84	207.2	17.04	162.7	0.0	29.90
45360.0	1983 JAN 25.5	18.91	245.3	0.11	324.5	76.6	19.43	30.25	266.7	1.25	255.1	-28.0	31.03	29.84	207.3	17.03	162.8	0.0	29.73
45370.0	1983 FEB 4.5	18.91	245.5	0.11	324.2	76.7	19.28	30.25	266.7	1.25	255.2	-28.0	30.91	29.83	207.4	17.03	162.9	0.0	29.57
45380.0	1983 FEB 14.5	18.92	245.6	0.11	323.9	76.8	19.12	30.25	266.8	1.24	255.3	-28.0	30.78	29.83	207.4	17.03	162.9	0.0	29.41
45390.0	1983 FEB 24.5	18.92	245.7	0.11	323.5	76.9	18.96	30.25	266.9	1.24	255.3	-28.0	30.63	29.83	207.5	17.03	163.0	0.0	29.27
45400.0	1983 MAR 6.5	18.92	245.8	0.11	323.2	77.0	18.79	30.25	266.9	1.24	255.4	-28.0	30.47	29.83	207.6	17.02	163.1	0.0	29.14
45410.0	1983 MAR 16.5	18.92	245.9	0.11	322.9	77.1	18.62	30.25	267.0	1.24	255.5	-28.0	30.30	29.83	207.6	17.02	163.1	0.0	29.03
45420.0	1983 MAR 26.5	18.92	246.1	0.10	322.6	77.2	18.46	30.25	267.0	1.24	255.5	-28.0	30.12	29.82	207.7	17.02	163.2	0.0	28.95
45430.0	1983 APR 5.5	18.93	246.2	0.10	322.2	77.3	18.32	30.25	267.1	1.24	255.6	-28.0	29.96	29.82	207.8	17.02	163.3	0.0	28.89
45440.0	1983 APR 15.5	18.93	246.3	0.10	321.9	77.4	18.19	30.25	267.2	1.24	255.7	-28.0	29.80	29.82	207.9	17.01	163.3	0.0	28.86
45450.0	1983 APR 25.5	18.93	246.4	0.10	321.5	77.5	18.08	30.25	267.2	1.24	255.7	-28.0	29.65	29.82	207.9	17.01	163.4	0.0	28.86
45460.0	1983 MAY 5.5	18.93	246.5	0.10	321.2	77.5	18.00	30.25	267.3	1.23	255.8	-28.1	29.52	29.82	208.0	17.01	163.5	0.0	28.89
45470.0	1983 MAY 15.5	18.93	246.7	0.10	320.8	77.6	17.95	30.25	267.3	1.23	255.8	-28.1	29.41	29.81	208.1	17.01	163.5	0.0	28.95
45480.0	1983 MAY 25.5	18.93	246.8	0.09	320.5	77.7	17.92	30.24	267.4	1.23	255.9	-28.1	29.32	29.81	208.1	17.00	163.6	0.0	29.03
45490.0	1983 JUN 4.5	18.94	246.9	0.09	320.1	77.8	17.93	30.24	267.4	1.23	256.0	-28.1	29.26	29.81	208.2	17.00	163.7	0.0	29.13
45500.0	1983 JUN 14.5	18.94	247.0	0.09	319.7	77.9	17.96	30.24	267.5	1.23	256.0	-28.1	29.23	29.81	208.3	17.00	163.7	0.0	29.25
45510.0	1983 JUN 24.5	18.94	247.1	0.09	319.3	78.0	18.02	30.24	267.6	1.23	256.1	-28.1	29.23	29.81	208.3	16.99	163.8	0.0	29.39
45520.0	1983 JUL 4.5	18.94	247.3	0.09	319.0	78.1	18.11	30.24	267.6	1.23	256.2	-28.1	29.26	29.80	208.4	16.99	163.9	0.0	29.54
45530.0	1983 JUL 14.5	18.94	247.4	0.09	318.6	78.2	18.22	30.24	267.7	1.22	256.2	-28.1	29.31	29.80	208.5	16.99	164.0	0.0	29.70
45540.0	1983 JUL 24.5	18.95	247.5	0.08	318.2	78.3	18.36	30.24	267.7	1.22	256.3	-28.1	29.40	29.80	208.6	16.98	164.0	0.0	29.85
45550.0	1983 AUG 3.5	18.95	247.6	0.08	317.8	78.4	18.50	30.24	267.8	1.22	256.4	-28.1	29.50	29.80	208.6	16.98	164.1	0.0	30.01
45560.0	1983 AUG 13.5	18.95	247.7	0.08	317.4	78.4	18.66	30.24	267.9	1.22	256.4	-28.1	29.63	29.80	208.7	16.98	164.2	0.0	30.16
45570.0	1983 AUG 23.5	18.95	247.9	0.08	316.9	78.5	18.83	30.24	267.9	1.22	256.5	-28.1	29.77	29.79	208.8	16.98	164.2	0.0	30.30
45580.0	1983 SEP 2.5	18.95	248.0	0.08	316.5	78.6	19.00	30.24	268.0	1.22	256.6	-28.1	29.93	29.79	208.8	16.97	164.3	0.0	30.43
45590.0	1983 SEP 12.5	18.95	248.1	0.08	316.1	78.7	19.17	30.24	268.0	1.22	256.6	-28.1	30.10	29.79	208.9	16.97	164.4	0.0	30.53

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
45600.0	1983 SEP 22.5	1.00	358.6	0.0	178.7	0.5	5.31	254.9	0.56	298.5	-2.7	5.64	9.81	216.0	2.43	38.6	17.3	10.63
45610.0	1983 OCT 2.5	1.00	8.4	0.0	187.7	-3.3	5.31	255.7	0.54	299.3	-2.7	5.77	9.82	216.4	2.43	38.9	17.4	10.71
45620.0	1983 OCT 12.5	1.00	18.3	0.0	196.9	-7.2	5.31	256.5	0.52	300.1	-2.7	5.90	9.82	216.7	2.42	39.2	17.5	10.77
45630.0	1983 OCT 22.5	1.00	28.2	0.0	206.2	-10.8	5.30	257.3	0.51	300.9	-2.6	6.00	9.82	217.0	2.42	39.5	17.7	10.80
45640.0	1983 NOV 1.5	0.99	38.2	0.0	215.8	-14.2	5.30	258.1	0.49	301.7	-2.6	6.10	9.82	217.3	2.42	39.9	17.8	10.81
45650.0	1983 NOV 11.5	0.99	48.2	0.0	225.8	-17.3	5.30	258.9	0.47	302.5	-2.6	6.17	9.83	217.6	2.41	40.2	17.9	10.80
45660.0	1983 NOV 21.5	0.99	58.3	0.0	236.1	-19.8	5.29	259.7	0.45	303.3	-2.6	6.23	9.83	217.9	2.41	40.5	18.0	10.76
45670.0	1983 DEC 1.5	0.99	68.4	0.0	246.7	-21.7	5.29	260.5	0.44	304.1	-2.5	6.26	9.83	218.2	2.41	40.8	18.1	10.69
45680.0	1983 DEC 11.5	0.98	78.6	0.0	257.6	-23.0	5.29	261.3	0.42	304.9	-2.5	6.27	9.83	218.6	2.40	41.1	18.2	10.61
45690.0	1983 DEC 21.5	0.98	88.7	0.0	268.5	-23.4	5.28	262.1	0.40	305.7	-2.5	6.26	9.84	218.9	2.40	41.4	18.3	10.50
45700.0	1984 JAN 0.5	0.98	98.9	0.0	279.7	-23.1	5.28	262.9	0.39	306.5	-2.5	6.23	9.84	219.2	2.39	41.7	18.4	10.37
45710.0	1984 JAN 10.5	0.98	109.1	0.0	290.7	-22.1	5.28	263.7	0.37	307.3	-2.4	6.18	9.84	219.5	2.39	42.0	18.5	10.22
45720.0	1984 JAN 20.5	0.98	119.3	0.0	301.5	-20.3	5.27	264.5	0.35	308.1	-2.4	6.11	9.84	219.8	2.39	42.3	18.6	10.07
45730.0	1984 JAN 30.5	0.99	129.5	0.0	311.9	-17.9	5.27	265.3	0.33	309.0	-2.4	6.02	9.85	220.1	2.38	42.7	18.7	9.91
45740.0	1984 FEB 9.5	0.99	139.6	0.0	322.0	-14.9	5.27	266.1	0.31	309.8	-2.4	5.91	9.85	220.4	2.38	43.0	18.8	9.74
45750.0	1984 FEB 19.5	0.99	149.7	0.0	331.8	-11.6	5.26	266.9	0.30	310.6	-2.3	5.78	9.85	220.8	2.38	43.3	18.9	9.58
45760.0	1984 MAR 0.5	0.99	159.8	0.0	341.3	-7.9	5.26	267.7	0.28	311.4	-2.3	5.65	9.85	221.1	2.37	43.6	19.0	9.42
45770.0	1984 MAR 10.5	0.99	169.8	0.0	350.6	-4.0	5.26	268.5	0.26	312.2	-2.3	5.50	9.86	221.4	2.37	43.9	19.1	9.27
45780.0	1984 MAR 20.5	1.00	179.7	0.0	359.8	-0.1	5.25	269.4	0.24	313.0	-2.2	5.34	9.86	221.7	2.36	44.2	19.2	9.14
45790.0	1984 MAR 30.5	1.00	189.6	0.0	8.9	3.8	5.25	270.2	0.22	313.8	-2.2	5.18	9.86	222.0	2.36	44.5	19.3	9.03
45800.0	1984 APR 9.5	1.00	199.5	0.0	18.0	7.6	5.25	271.0	0.21	314.6	-2.2	5.02	9.86	222.3	2.35	44.9	19.4	8.95
45810.0	1984 APR 19.5	1.00	209.3	0.0	27.2	11.2	5.24	271.8	0.19	315.5	-2.2	4.86	9.86	222.6	2.35	45.2	19.5	8.89
45820.0	1984 APR 29.5	1.01	219.0	0.0	36.6	14.5	5.24	272.6	0.17	316.3	-2.1	4.71	9.87	223.0	2.35	45.5	19.6	8.86
45830.0	1984 MAY 9.5	1.01	228.7	0.0	46.3	17.4	5.24	273.4	0.15	317.1	-2.1	4.57	9.87	223.3	2.34	45.8	19.7	8.87
45840.0	1984 MAY 19.5	1.01	238.4	0.0	56.1	19.8	5.23	274.3	0.13	317.9	-2.1	4.45	9.87	223.6	2.34	46.1	19.8	8.90
45850.0	1984 MAY 29.5	1.01	248.0	0.0	66.2	21.6	5.23	275.1	0.11	318.7	-2.0	4.35	9.87	223.9	2.33	46.4	19.9	8.96
45860.0	1984 JUN 8.5	1.02	257.5	0.0	76.5	22.9	5.22	275.9	0.09	319.6	-2.0	4.27	9.88	224.2	2.33	46.7	20.0	9.05
45870.0	1984 JUN 18.5	1.02	267.1	0.0	86.8	23.4	5.22	276.7	0.08	320.4	-2.0	4.22	9.88	224.5	2.32	47.1	20.1	9.15
45880.0	1984 JUN 28.5	1.02	276.6	0.0	97.2	23.3	5.22	277.5	0.06	321.2	-1.9	4.20	9.88	224.8	2.32	47.4	20.2	9.29
45890.0	1984 JUL 8.5	1.02	286.2	0.0	107.5	22.5	5.21	278.4	0.04	322.0	-1.9	4.21	9.88	225.1	2.31	47.7	20.3	9.43
45900.0	1984 JUL 18.5	1.02	295.7	0.0	117.7	21.0	5.21	279.2	0.02	322.9	-1.9	4.25	9.89	225.4	2.31	48.0	20.4	9.59
45910.0	1984 JUL 28.5	1.02	305.2	0.0	127.6	19.0	5.21	280.0	0.00	323.7	-1.8	4.31	9.89	225.8	2.30	48.3	20.5	9.75
45920.0	1984 AUG 7.5	1.01	314.8	0.0	137.3	16.4	5.20	280.9	-0.02	324.5	-1.8	4.40	9.89	226.1	2.30	48.6	20.6	9.92
45930.0	1984 AUG 17.5	1.01	324.4	0.0	146.7	13.4	5.20	281.7	-0.04	325.3	-1.7	4.51	9.89	226.4	2.29	49.0	20.7	10.08
45940.0	1984 AUG 27.5	1.01	334.1	0.0	156.0	10.0	5.20	282.5	-0.06	326.2	-1.7	4.64	9.89	226.7	2.29	49.3	20.7	10.24
45950.0	1984 SEP 6.5	1.01	343.7	0.0	165.0	6.4	5.19	283.3	-0.08	327.0	-1.7	4.78	9.90	227.0	2.28	49.6	20.8	10.39
45960.0	1984 SEP 16.5	1.01	353.5	0.0	174.0	2.5	5.19	284.2	-0.09	327.8	-1.6	4.92	9.90	227.3	2.27	49.9	20.9	10.52
45970.0	1984 SEP 26.5	1.00	3.2	0.0	183.0	-1.3	5.18	285.0	-0.11	328.7	-1.6	5.08	9.90	227.6	2.27	50.2	21.0	10.64
45980.0	1984 OCT 6.5	1.00	13.1	0.0	192.0	-5.2	5.18	285.9	-0.13	329.5	-1.6	5.23	9.90	227.9	2.26	50.6	21.1	10.74
45990.0	1984 OCT 16.5	1.00	23.0	0.0	201.3	-9.9	5.18	286.7	-0.15	330.3	-1.5	5.38	9.91	228.2	2.26	50.9	21.2	10.81
46000.0	1984 OCT 26.5	0.99	32.9	0.0	210.7	-12.5	5.17	287.5	-0.17	331.2	-1.5	5.52	9.91	228.6	2.25	51.2	21.3	10.87
46010.0	1984 NOV 5.5	0.99	42.9	0.0	220.5	-15.7	5.17	288.4	-0.19	332.0	-1.4	5.65	9.91	228.9	2.25	51.5	21.4	10.90
46020.0	1984 NOV 15.5	0.99	53.0	0.0	230.6	-18.5	5.17	289.2	-0.21	332.9	-1.4	5.77	9.91	229.2	2.24	51.8	21.5	10.90
46030.0	1984 NOV 25.5	0.99	63.1	0.0	241.1	-20.8	5.16	290.1	-0.23	333.7	-1.4	5.88	9.91	229.5	2.23	52.1	21.5	10.88
46040.0	1984 DEC 5.5	0.99	73.2	0.0	251.8	-22.4	5.16	290.9	-0.25	334.6	-1.3	5.97	9.92	229.8	2.23	52.5	21.6	10.83
46050.0	1984 DEC 15.5	0.98	83.4	0.0	262.8	-23.3	5.16	291.7	-0.26	335.4	-1.3	6.04	9.92	230.1	2.22	52.8	21.7	10.75
46060.0	1984 DEC 25.5	0.98	93.6	0.0	273.9	-23.4	5.15	292.6	-0.28	336.2	-1.2	6.09	9.92	230.4	2.22	53.1	21.8	10.66
46070.0	1985 JAN 4.5	0.98	103.7	0.0	285.0	-22.7	5.15	293.4	-0.30	337.1	-1.2	6.12	9.92	230.7	2.21	53.4	21.9	10.54
46080.0	1985 JAN 14.5	0.98	113.9	0.0	295.8	-21.3	5.14	294.3	-0.32	337.9	-1.2	6.13	9.92	231.0	2.20	53.7	22.0	10.41
46090.0	1985 JAN 24.5	0.98	124.1	0.0	306.5	-19.2	5.14	295.1	-0.34	338.8	-1.1	6.12	9.93	231.3	2.20	54.1	22.0	10.26
46100.0	1985 FEB 3.5	0.99	134.3	0.0	316.8	-16.5	5.14	296.0	-0.36	339.6	-1.1	6.08	9.93	231.6	2.19	54.4	22.1	10.10
46110.0	1985 FEB 13.5	0.99	144.4	0.0	326.7	-13.4	5.13	296.8	-0.38	340.5	-1.0	6.03	9.93	232.0	2.19	54.7	22.2	9.94
46120.0	1985 FEB 23.5	0.99	154.5	0.0	336.4	-9.9	5.13	297.7	-0.40	341.3	-1.0	5.95	9.93	232.3	2.18	55.0	22.3	9.77
46130.0	1985 MAR 5.5	0.99	164.5	0.0	345.8	-6.1	5.13	298.5	-0.41	342.2	-0.9	5.86	9.93	232.6	2.17	55.4	22.4	9.61
46140.0	1985 MAR 15.5	0.99	174.5	0.0	355.0	-2.2	5.12	299.4	-0.43	343.0	-0.9	5.75	9.94	232.9	2.17	55.7	22.4	9.45
46150.0	1985 MAR 25.5	1.00	184.4	0.0	4.1	1.8	5.12	300.2	-0.45	343.9	-0.9	5.63	9.94	233.2	2.16	56.0	22.5	9.31
46160.0	1985 APR 4.5	1.00	194.3	0.0	13.2	5.7	5.12	301.1	-0.47	344.8	-0.8	5.49	9.94	233.5	2.15	56.3	22.6	9.19
46170.0	1985 APR 14.5	1.00	204.1	0.0	22.4	9.4	5.11	302.0	-0.49	345.6	-0.8	5.34	9.94	233.8	2.15	56.6	22.7	9.09
46180.0	1985 APR 24.5	1.01	213.9	0.0	31.7	12.8	5.11	302.8	-0.51	346.5	-0.7	5.19	9.94	234.1	2.14	57.0	22.7	9.01
46190.0	1985 MAY 4.5	1.01	223.6	0.0	41.2	15.9	5.11	303.7	-0.52	347.3	-0.7	5.03	9.95	234.4	2.13	57.3	22.8	8.96
46200.0	1985 MAY 14.5	1.01	233.3	0.0	50.9	18.5	5.10	304.5	-0.54	348.2	-0.6	4.87	9.95	234.7	2.13	57.6	22.9	8.94
46210.0	1985 MAY 24.5	1.01	242.9	0.0	60.9	20.8	5.10	305.4	-0.56	349.1	-0.6	4.72	9.95	235.0	2.12	57.9	23.0	8.95
46220.0	1985 JUN 3.5	1.01	252.5	0.0	71.1	22.3	5.10	306.3	-0.58	349.9	-0.5	4.57	9.95	235.3	2.11	58.3	23.0	8.99
46230.0	1985 JUN 13.5	1.02	262.1	0.0	81.4	23.2	5.09	307.1	-0.59	350.8	-0.5	4.43	9.95	235.6	2.10	58.6	23.1	9.05
46240.0	1985 JUN 23.5	1.02	271.6	0.0	91.8	23.4	5.09	308.0	-0.61	351.6	-0.4	4.31	9.96	235.9	2.10	58.9	23.2	9.15
46250.0	1985 JUL 3.5	1.02	281.1	0.0	102.1	23.0	5.09	308.9	-0.63	352.5	-0.4	4.21	9.96	236.3	2.09	59.2	23.2	9.27
46260.0	1985 JUL 13.5	1.02	290.7	0.0	112.4	21.9	5.08	309.7	-0.65	353.4	-0.4	4.14	9.96	236.6	2.08	59.6	23.3	9.40
46270.0	1985 JUL 23.5	1.02	300.2	0.0	122.4	20.1	5.08	310.6	-0.66	354.3	-0.3	4.08	9.96	236.9	2.08	59.9	23.4	9.55
46280.0	1985 AUG 2.5	1.01	309.8	0.0	132.2	17.8	5.08	311.5	-0.68	355.1	-0.3	4.06	9.96	237.2	2.07	60.2	23.4	9.71
46290.0	1985 AUG 12.5	1.01	319.4	0.0	141.8	15.0	5.07	312.4	-0.70	356.0	-0.2	4.07	9.96	237.5	2.06	60.5	23.5	9.87
46300.0	1985 AUG 22.5	1.01	329.0	0.0	151.1	11.8	5.07	313.2	-0.71	356.9	-0.2	4.11	9.97	237.8	2.05	60.9	23.6	10.04
46310.0	1985 SEP 1.5	1.01	338.6	0.0	160.3	8.3	5.07	314.1	-0.73	357.7	-0.1	4.17	9.97	238.1	2.05	61.2	23.7	10.20
46320.0	1985 SEP 11.5	1.01	348.3	0.0	169.3	4.6	5.06	315.0	-0.75	358.6	-0.1	4.26	9.97	238.4	2.04	61.5	23.7	10.36
46330.0	1985 SEP 21.5	1.00	358.1	0.0	178.3	0.8	5.06	315.9	-0.76	359.5	-0.0	4.37	9.97	238.7	2.03	61.8	23.8	10.50
46340.0	1985 OCT 1.5	1.00	7.9	0.0	187.3	-3.1	5.06	316.7	-0.78	0.4	0.0	4.50	9.97	239.0	2.02	62.2	23.8	10.63
46350.0	1985 OCT 11.5	1.00	17.8	0.0	196.4	-7.0	5.05	317.6	-0.80	1.2	0.1	4.64	9.98	239.3	2.01	62.5	23.9	10.74
46360.0	1985 OCT 21.5	1.00	27.7	0.0	205.7	-10.7	5.05	318.5	-0.81	2.1	0.1	4.79	9.98	239.6	2.01	62.8	24.0	10.83
46370.0	1985 NOV 0.5	0.99	37.7	0.0	215.3	-14.1	5.05	319.4	-0.83	3.0	0.2	4.94	9.98	239.9	2.00	63.2	24.0	10.90
46380.0	1985 NOV 10.5	0.99	47.7	0.0	225.2	-17.1	5.04	320.3	-0.84	3.9	0.2	5.10	9.98	240.2	1.99	63.5	24.1	10.95
46390.0	1985 NOV 20.5	0.99	57.8	0.0	235.5	-19.7	5.04	321.1	-0.86	4.8	0.3	5.25	9.98	240.5	1.98	63.8	24.2	10.97
46400.0	1985 DEC 0.5	0.99	67.9	0.0	246.1	-21.6	5.04	322.0	-0.87	5.6	0.3	5.39	9.98	240.8	1.97	64.1	24.2	10.96
46410.0	1985 DEC 10.5	0.98	78.0	0.0	257.0	-22.9	5.04	322.9	-0.89	6.5	0.3	5.53	9.99	241.1	1.97	64.5	24.3	10.93
46420.0	1985 DEC 20.5	0.98	88.2	0.0	268.1	-23.4	5.03	323.8	-0.90	7.4	0.4	5.65	9.99	241.5	1.96	64.8	24.3	10.87
46430.0	1985 DEC 30.5	0.98	98.4	0.0	279.2	-23.2	5.03	324.7	-0.92	8.3	0.4	5.75	9.99	241.8	1.95	65.1	24.4	10.79
46440.0	1986 JAN 9.5	0.98	108.6	0.0	290.1	-22.2	5.03	325.6	-0.93	9.2	0.5	5.84	9.99	242.1	1.94	65.4	24.4	10.69

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
45600.0	1983 SEP 22.5	18.96	248.2	0.08	315.7	78.8	19.33	30.24	268.1	1.22	256.7	-28.1	30.27	29.79	209.0	16.97	164.4	0.0	30.62
45610.0	1983 OCT 2.5	18.96	248.3	0.07	315.2	78.9	19.48	30.24	268.2	1.21	256.8	-28.2	30.44	29.79	209.1	16.96	164.5	0.0	30.59
45620.0	1983 OCT 12.5	18.96	248.5	0.07	314.8	79.0	19.61	30.24	268.2	1.21	256.8	-28.2	30.60	29.78	209.1	16.96	164.6	0.0	30.72
45630.0	1983 OCT 22.5	18.96	248.6	0.07	314.3	79.0	19.73	30.24	268.3	1.21	256.9	-28.2	30.75	29.78	209.2	16.96	164.6	0.0	30.74
45640.0	1983 NOV 1.5	18.96	248.7	0.07	313.9	79.1	19.82	30.24	268.3	1.21	257.0	-28.2	30.89	29.78	209.3	16.95	164.7	0.0	30.72
45650.0	1983 NOV 11.5	18.97	248.8	0.07	313.4	79.2	19.90	30.24	268.4	1.21	257.0	-28.2	31.00	29.78	209.3	16.95	164.8	0.0	30.68
45660.0	1983 NOV 21.5	18.97	248.9	0.07	312.9	79.3	19.94	30.24	268.5	1.21	257.1	-28.2	31.10	29.78	209.4	16.95	164.8	0.0	30.61
45670.0	1983 DEC 1.5	18.97	249.1	0.06	312.5	79.4	19.95	30.24	268.5	1.21	257.2	-28.2	31.17	29.78	209.5	16.94	164.9	0.0	30.52
45680.0	1983 DEC 11.5	18.97	249.2	0.06	312.0	79.5	19.94	30.24	268.6	1.20	257.2	-28.2	31.21	29.77	209.5	16.94	165.0	0.0	30.40
45690.0	1983 DEC 21.5	18.97	249.3	0.06	311.5	79.5	19.90	30.24	268.6	1.20	257.3	-28.2	31.22	29.77	209.6	16.94	165.0	0.0	30.27
45700.0	1984 JAN 0.5	18.97	249.4	0.06	311.0	79.6	19.84	30.24	268.7	1.20	257.4	-28.2	31.21	29.77	209.7	16.93	165.1	0.0	30.12
45710.0	1984 JAN 10.5	18.98	249.5	0.06	310.5	79.7	19.74	30.24	268.7	1.20	257.4	-28.2	31.16	29.77	209.8	16.93	165.2	0.0	29.96
45720.0	1984 JAN 20.5	18.98	249.7	0.06	310.0	79.8	19.63	30.24	268.8	1.20	257.5	-28.2	31.09	29.77	209.8	16.93	165.2	0.0	29.79
45730.0	1984 JAN 30.5	18.98	249.8	0.05	309.4	79.8	19.50	30.24	268.9	1.20	257.6	-28.2	30.99	29.76	209.9	16.92	165.3	0.0	29.62
45740.0	1984 FEB 9.5	18.98	249.9	0.05	308.9	79.9	19.35	30.24	268.9	1.20	257.6	-28.2	30.87	29.76	210.0	16.92	165.4	0.0	29.46
45750.0	1984 FEB 19.5	18.98	250.0	0.05	308.4	80.0	19.19	30.24	269.0	1.20	257.7	-28.2	30.74	29.76	210.0	16.92	165.4	0.0	29.31
45760.0	1984 MAR 0.5	18.99	250.1	0.05	307.8	80.1	19.02	30.24	269.0	1.19	257.8	-28.2	30.58	29.76	210.1	16.91	165.5	0.0	29.16
45770.0	1984 MAR 10.5	18.99	250.3	0.05	307.3	80.1	18.85	30.24	269.1	1.19	257.8	-28.3	30.42	29.76	210.2	16.91	165.6	0.0	29.04
45780.0	1984 MAR 20.5	18.99	250.4	0.05	306.7	80.2	18.68	30.24	269.2	1.19	257.9	-28.3	30.25	29.76	210.3	16.91	165.6	0.0	28.94
45790.0	1984 MAR 30.5	18.99	250.5	0.04	306.1	80.3	18.52	30.24	269.2	1.19	258.0	-28.3	30.07	29.75	210.3	16.90	165.7	0.0	28.86
45800.0	1984 APR 9.5	18.99	250.6	0.04	305.5	80.3	18.38	30.24	269.3	1.19	258.0	-28.3	29.91	29.75	210.4	16.90	165.8	0.0	28.81
45810.0	1984 APR 19.5	18.99	250.7	0.04	305.0	80.4	18.25	30.24	269.3	1.19	258.1	-28.3	29.75	29.75	210.5	16.89	165.8	0.0	28.79
45820.0	1984 APR 29.5	19.00	250.9	0.04	304.4	80.5	18.15	30.24	269.4	1.19	258.2	-28.3	29.61	29.75	210.5	16.89	165.9	0.0	28.80
45830.0	1984 MAY 9.5	19.00	251.0	0.04	303.8	80.5	18.07	30.24	269.5	1.18	258.2	-28.3	29.48	29.75	210.6	16.89	166.0	0.0	28.83
45840.0	1984 MAY 19.5	19.00	251.1	0.04	303.2	80.6	18.01	30.24	269.5	1.18	258.3	-28.3	29.38	29.75	210.7	16.88	166.0	0.0	28.89
45850.0	1984 MAY 29.5	19.00	251.2	0.03	302.5	80.7	17.99	30.24	269.6	1.18	258.4	-28.3	29.30	29.74	210.7	16.88	166.1	0.0	28.98
45860.0	1984 JUN 8.5	19.00	251.3	0.03	301.9	80.7	17.99	30.24	269.6	1.18	258.4	-28.3	29.25	29.74	210.8	16.88	166.2	0.0	29.09
45870.0	1984 JUN 18.5	19.01	251.4	0.03	301.3	80.8	18.03	30.24	269.7	1.18	258.5	-28.3	29.22	29.74	210.9	16.87	166.2	0.0	29.21
45880.0	1984 JUN 28.5	19.01	251.6	0.03	300.6	80.9	18.09	30.24	269.8	1.18	258.6	-28.3	29.23	29.74	211.0	16.87	166.3	0.0	29.35
45890.0	1984 JUL 8.5	19.01	251.7	0.03	300.0	80.9	18.18	30.24	269.8	1.18	258.6	-28.3	29.26	29.74	211.0	16.86	166.4	0.0	29.50
45900.0	1984 JUL 18.5	19.01	251.8	0.03	299.3	81.0	18.29	30.24	269.9	1.17	258.7	-28.3	29.33	29.74	211.1	16.86	166.5	0.0	29.66
45910.0	1984 JUL 28.5	19.01	251.9	0.03	298.5	81.0	18.42	30.24	269.9	1.17	258.8	-28.3	29.41	29.73	211.2	16.86	166.5	0.0	29.82
45920.0	1984 AUG 7.5	19.01	252.0	0.02	298.0	81.1	18.57	30.24	270.0	1.17	258.9	-28.3	29.53	29.73	211.2	16.85	166.6	0.0	29.98
45930.0	1984 AUG 17.5	19.02	252.2	0.02	297.3	81.1	18.73	30.24	270.0	1.17	258.9	-28.3	29.66	29.73	211.3	16.85	166.7	0.0	30.13
45940.0	1984 AUG 27.5	19.02	252.3	0.02	296.6	81.2	18.90	30.24	270.1	1.17	259.0	-28.4	29.81	29.73	211.4	16.84	166.7	0.0	30.26
45950.0	1984 SEP 6.5	19.02	252.4	0.02	295.9	81.3	19.07	30.24	270.2	1.17	259.1	-28.4	29.97	29.73	211.5	16.84	166.8	0.0	30.39
45960.0	1984 SEP 16.5	19.02	252.5	0.02	295.2	81.3	19.24	30.24	270.2	1.17	259.1	-28.4	30.13	29.73	211.5	16.84	166.9	0.0	30.49
45970.0	1984 SEP 26.5	19.02	252.6	0.02	294.4	81.4	19.40	30.24	270.3	1.17	259.2	-28.4	30.30	29.72	211.6	16.83	166.9	0.0	30.57
45980.0	1984 OCT 6.5	19.03	252.8	0.01	293.7	81.4	19.55	30.24	270.3	1.16	259.3	-28.4	30.47	29.72	211.7	16.83	167.0	0.0	30.63
45990.0	1984 OCT 16.5	19.03	252.9	0.01	293.0	81.4	19.68	30.24	270.4	1.16	259.3	-28.4	30.63	29.72	211.7	16.82	167.1	0.0	30.67
46000.0	1984 OCT 26.5	19.03	253.0	0.01	292.2	81.5	19.80	30.24	270.5	1.16	259.4	-28.4	30.78	29.72	211.8	16.82	167.1	0.0	30.67
46010.0	1984 NOV 5.5	19.03	253.1	0.01	291.5	81.5	19.89	30.23	270.5	1.16	259.5	-28.4	30.91	29.72	211.9	16.82	167.2	0.0	30.65
46020.0	1984 NOV 15.5	19.03	253.2	0.01	290.7	81.6	19.96	30.23	270.6	1.16	259.5	-28.4	31.02	29.72	211.9	16.81	167.3	0.0	30.60
46030.0	1984 NOV 25.5	19.04	253.4	0.01	290.0	81.6	20.01	30.23	270.6	1.16	259.6	-28.4	31.11	29.71	212.0	16.81	167.3	0.0	30.53
46040.0	1984 DEC 5.5	19.04	253.5	0.00	289.2	81.7	20.02	30.23	270.7	1.16	259.7	-28.4	31.18	29.71	212.1	16.80	167.4	0.0	30.43
46050.0	1984 DEC 15.5	19.04	253.6	0.00	288.4	81.7	20.01	30.23	270.8	1.15	259.7	-28.4	31.21	29.71	212.2	16.80	167.5	0.0	30.31
46060.0	1984 DEC 25.5	19.04	253.7	0.00	287.5	81.7	19.97	30.23	270.8	1.15	259.8	-28.4	31.22	29.71	212.2	16.80	167.5	0.0	30.17
46070.0	1985 JAN 4.5	19.04	253.8	-0.00	286.8	81.8	19.90	30.23	270.9	1.15	259.9	-28.4	31.19	29.71	212.3	16.79	167.6	0.0	30.02
46080.0	1985 JAN 14.5	19.04	254.0	-0.00	286.0	81.8	19.81	30.23	270.9	1.15	259.9	-28.4	31.14	29.71	212.4	16.79	167.7	0.0	29.86
46090.0	1985 JAN 24.5	19.05	254.1	-0.00	285.2	81.8	19.69	30.23	271.0	1.15	260.0	-28.4	31.06	29.71	212.4	16.78	167.7	0.0	29.69
46100.0	1985 FEB 3.5	19.05	254.2	-0.01	284.4	81.9	19.56	30.23	271.1	1.15	260.1	-28.4	30.96	29.70	212.5	16.78	167.8	0.0	29.53
46110.0	1985 FEB 13.5	19.05	254.3	-0.01	283.5	81.9	19.41	30.23	271.1	1.15	260.1	-28.4	30.83	29.70	212.6	16.77	167.9	0.0	29.37
46120.0	1985 FEB 23.5	19.05	254.4	-0.01	282.8	81.9	19.25	30.23	271.2	1.14	260.2	-28.4	30.69	29.70	212.7	16.77	167.9	0.0	29.21
46130.0	1985 MAR 5.5	19.05	254.5	-0.01	282.0	81.9	19.08	30.23	271.2	1.14	260.3	-28.4	30.53	29.70	212.7	16.76	168.0	0.0	29.08
46140.0	1985 MAR 15.5	19.06	254.7	-0.01	281.1	82.0	18.91	30.23	271.3	1.14	260.3	-28.5	30.47	29.70	212.8	16.76	168.1	0.0	28.96
46150.0	1985 MAR 25.5	19.06	254.8	-0.01	280.3	82.0	18.75	30.23	271.3	1.14	260.4	-28.5	30.19	29.70	212.9	16.76	168.1	0.0	28.86
46160.0	1985 APR 4.5	19.06	254.9	-0.01	279.5	82.0	13.59	30.23	271.4	1.14	260.5	-28.5	30.02	29.69	212.9	16.75	168.2	0.0	28.79
46170.0	1985 APR 14.5	19.06	255.0	-0.02	278.6	82.0	18.44	30.23	271.5	1.14	260.5	-28.5	29.86	29.69	213.0	16.75	168.3	0.0	28.75
46180.0	1985 APR 24.5	19.06	255.1	-0.02	277.8	82.0	18.32	30.23	271.5	1.14	260.6	-28.5	29.71	29.69	213.1	16.74	168.4	0.0	28.73
46190.0	1985 MAY 4.5	19.06	255.3	-0.02	276.9	82.1	18.21	30.23	271.6	1.13	260.7	-28.5	29.57	29.69	213.2	16.74	168.4	0.0	28.74
46200.0	1985 MAY 14.5	19.07	255.4	-0.02	276.1	82.1	18.13	30.23	271.6	1.13	260.7	-28.5	29.45	29.69	213.2	16.73	168.5	0.0	28.78
46210.0	1985 MAY 24.5	19.07	255.5	-0.02	275.2	82.1	13.08	30.23	271.7	1.13	260.8	-28.5	29.35	29.69	213.3	16.73	168.6	0.0	28.85
46220.0	1985 JUN 3.5	19.07	255.6	-0.02	274.3	82.1	18.06	30.23	271.8	1.13	260.9	-28.5	29.28	29.69	213.4	16.72	168.6	0.0	28.94
46230.0	1985 JUN 13.5	19.07	255.7	-0.03	273.5	82.1	18.06	30.23	271.8	1.13	260.9	-28.5	29.23	29.68	213.4	16.72	168.7	0.0	29.05
46240.0	1985 JUN 23.5	19.07	255.9	-0.03	272.6	82.1	18.10	30.23	271.9	1.13	261.0	-28.5	29.21	29.68	213.5	16.71	168.8	0.0	29.18
46250.0	1985 JUL 3.5	19.08	256.0	-0.03	271.8	82.1	18.16	30.23	271.9	1.13	261.1	-28.5	29.23	29.68	213.6	16.71	168.8	0.0	29.33
46260.0	1985 JUL 13.5	19.08	256.1	-0.03	270.9	82.1	18.25	30.23	272.0	1.12	261.1	-28.5	29.27	29.68	213.6	16.70	168.9	0.0	29.48
46270.0	1985 JUL 23.5	19.08	256.2	-0.03	270.0	82.1	18.36	30.23	272.1	1.12	261.2	-28.5	29.34	29.68	213.7	16.70	169.0	0.0	29.64
46280.0	1985 AUG 2.5	19.08	256.3	-0.03	269.2	82.1	18.49	30.23	272.1	1.12	261.3	-28.5	29.43	29.68	213.8	16.70	169.0	0.0	29.80
46290.0	1985 AUG 12.5	19.08	256.4	-0.04	268.3	82.1	18.64	30.23	272.2	1.12	261.3	-28.5	29.55	29.68	213.9	16.69	169.1	0.0	29.95
46300.0	1985 AUG 22.5	19.08	256.6	-0.04	267.4	82.1	18.80	30.23	272.2	1.12	261.4	-28.5	29.69	29.68	213.9	16.69	169.2	0.0	30.10
46310.0	1985 SEP 1.5	19.09	256.7	-0.04	266.6	82.1	18.97	30.23	272.3	1.12	261.5	-28.5	29.84	29.67	214.0	16.68	169.2	0.0	30.24
46320.0	1985 SEP 11.5	19.09	256.8	-0.04	265.7	82.1	19.14	30.23	272.4	1.12	261.5	-28.5	30.00	29.67	214.1	16.68	169.3	0.0	30.36
46330.0	1985 SEP 21.5	19.09	256.9	-0.04	264.9	82.1	19.31	30.23	272.4	1.11	261.6	-28.5	30.17	29.67	214.1	16.67	169.4	0.0	30.46
46340.0	1985 OCT 1.5	19.09	257.0	-0.04	264.0	82.1	19.47	30.23	272.5	1.11	261.7	-28.5	30.34	29.67	214.2	16.67	169.4	0.0	30.53
46350.0	1985 OCT 11.5	19.09	257.2	-0.05	263.2	82.1	19.62	30.23	272.5	1.11	261.7	-28.5	30.51	29.67	214.3	16.66	169.5	0.0	30.59
46360.0	1985 OCT 21.5	19.10	257.3	-0.05	262.3	82.0	19.76	30.23	272.6	1.11	261.8	-28.6	30.66	29.67	214.4	16.66	169.6	0.0	30.62
46370.0	1985 NOV 0.5	19.10	257.4	-0.05	261.5	82.0	19.87	30.23	272.6	1.11	261.9	-28.6	30.81	29.67	214.4	16.65	169.6	0.0	30.62
46380.0	1985 NOV 10.5	19.10	257.5	-0.05	260.6	82.0	19.96	30.23	272.7	1.11	261.9	-28.6	30.94	29.67	214.5	16.65	169.7	0.0	30.59
46390.0	1985 NOV 20.5	19.10	257.6	-0.05	259.8	82.0	20.03	30.23	272.8	1.11	262.0	-28.6	31.04	29.66	214.6	16.64	169.8	0.0	30.54
46400.0	1985 DEC 0.5	19.10	257.7	-0.05	259.0	82.0	20.08	30.23	272.8	1.10	262.1	-28.6	31.12	29.66	214.6	16.64	169.9	0.0	30.46
46410.0	1985 DEC 10.5	19.11	257.9	-0.05	258.1	81.9	20.09	30.23	272.9	1.10	262.1	-28.6	31.18	29.66	214.7	16.63	169.9	0.0	30.36
46420.0	1985 DEC 20.5	19.11	258.0	-0.06	257.3	81.9	20.08	30.23	272.9	1.10	262.2	-28.6	31.21	29.66	214.8	16.63	170.0	0.0	30.23
46430.0	1985 DEC 30.5	19.11	258.1	-0.06	256.5	81.9	20.03	30.23	273.0	1.10	262.3	-28.6	31.21	29.66	214.9	16.62	170.1	0.0	30.09
46440.0	1986 JAN 9.5	19.11	258.2	-0.06	255.7	81.9	19.97	30.23	273.1	1.10	262.3	-28.6	31.17	29.66	214.9	16.61	170.1	0.0	29.94

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
46450.0	1986 JAN 19.5	0.98	118.8	0.0	300.9	-20.4	5.03	326.5	-0.95	10.1	0.5	5.91	9.99	242.4	1.93	65.8	24.5	10.57
46460.0	1986 JAN 29.5	0.98	128.9	0.0	311.4	-18.0	5.02	327.4	-0.96	11.0	0.6	5.97	9.99	242.7	1.93	66.1	24.6	10.43
46470.0	1986 FEB 8.5	0.99	139.1	0.0	321.5	-15.1	5.02	328.2	-0.97	11.9	0.6	6.00	9.99	243.0	1.92	66.4	24.6	10.28
46480.0	1986 FEB 18.5	0.99	149.2	0.0	331.3	-11.8	5.02	329.1	-0.99	12.7	0.7	6.01	10.00	243.3	1.91	66.8	24.7	10.11
46490.0	1986 MAR 0.5	0.99	159.3	0.0	340.9	-8.1	5.01	330.0	-1.00	13.6	0.7	5.99	10.00	243.6	1.90	67.1	24.7	9.95
46500.0	1986 MAR 10.5	0.99	169.3	0.0	350.2	-4.2	5.01	330.9	-1.01	14.5	0.8	5.96	10.00	243.9	1.89	67.4	24.8	9.78
46510.0	1986 MAR 20.5	1.00	179.2	0.0	359.3	-0.3	5.01	331.8	-1.03	15.4	0.8	5.91	10.00	244.2	1.88	67.8	24.8	9.62
46520.0	1986 MAR 30.5	1.00	189.1	0.0	8.4	3.5	5.01	332.7	-1.04	16.3	0.9	5.84	10.00	244.5	1.87	68.1	24.9	9.47
46530.0	1986 APR 9.5	1.00	199.0	0.0	17.5	7.4	5.01	333.6	-1.05	17.2	0.9	5.75	10.00	244.8	1.87	68.4	24.9	9.33
46540.0	1986 APR 19.5	1.00	208.8	0.0	26.8	11.1	5.00	334.5	-1.06	18.1	1.0	5.65	10.00	245.1	1.86	68.7	25.0	9.22
46550.0	1986 APR 29.5	1.01	218.5	0.0	36.2	14.4	5.00	335.4	-1.07	19.0	1.0	5.53	10.01	245.4	1.85	69.1	25.0	9.12
46560.0	1986 MAY 9.5	1.01	228.2	0.0	45.8	17.3	5.00	336.3	-1.09	19.9	1.0	5.40	10.01	245.7	1.84	69.4	25.1	9.05
46570.0	1986 MAY 19.5	1.01	237.9	0.0	55.6	19.7	5.00	337.2	-1.10	20.8	1.1	5.26	10.01	246.0	1.83	69.7	25.1	9.01
46580.0	1986 MAY 29.5	1.01	247.5	0.0	65.7	21.6	4.99	338.1	-1.11	21.7	1.1	5.11	10.01	246.3	1.82	70.1	25.2	9.00
46590.0	1986 JUN 8.5	1.02	257.0	0.0	75.9	22.8	4.99	339.0	-1.12	22.6	1.2	4.95	10.01	246.6	1.81	70.4	25.2	9.02
46600.0	1986 JUN 18.5	1.02	266.6	0.0	86.3	23.4	4.99	339.9	-1.13	23.5	1.2	4.80	10.01	246.9	1.80	70.7	25.3	9.06
46610.0	1986 JUN 28.5	1.02	276.1	0.0	96.7	23.3	4.99	340.8	-1.14	24.4	1.3	4.64	10.01	247.2	1.79	71.1	25.3	9.14
46620.0	1986 JUL 8.5	1.02	285.7	0.0	107.0	22.5	4.99	341.7	-1.15	25.3	1.3	4.50	10.02	247.5	1.78	71.4	25.3	9.24
46630.0	1986 JUL 18.5	1.02	295.2	0.0	117.2	21.1	4.98	342.6	-1.16	26.2	1.4	4.36	10.02	247.8	1.78	71.7	25.4	9.36
46640.0	1986 JUL 28.5	1.02	304.8	0.0	127.1	19.1	4.98	343.5	-1.17	27.1	1.4	4.24	10.02	248.1	1.77	72.1	25.4	9.50
46650.0	1986 AUG 7.5	1.01	314.3	0.0	136.8	16.5	4.98	344.4	-1.18	28.0	1.4	4.13	10.02	248.4	1.76	72.4	25.5	9.65
46660.0	1986 AUG 17.5	1.01	323.9	0.0	146.3	13.5	4.98	345.3	-1.19	28.9	1.5	4.05	10.02	248.7	1.75	72.7	25.5	9.81
46670.0	1986 AUG 27.5	1.01	333.6	0.0	155.5	10.2	4.98	346.2	-1.19	29.8	1.5	4.00	10.02	249.0	1.74	73.1	25.6	9.98
46680.0	1986 SEP 6.5	1.01	343.2	0.0	164.6	6.6	4.97	347.1	-1.20	30.7	1.6	3.97	10.02	249.3	1.73	73.4	25.6	10.14
46690.0	1986 SEP 16.5	1.01	353.0	0.0	173.6	2.8	4.97	348.1	-1.21	31.6	1.6	3.97	10.02	249.7	1.72	73.7	25.6	10.30
46700.0	1986 SEP 26.5	1.00	2.7	0.0	182.5	-1.1	4.97	349.0	-1.22	32.6	1.7	4.01	10.03	250.0	1.71	74.1	25.7	10.45
46710.0	1986 OCT 6.5	1.00	12.6	0.0	191.6	-5.0	4.97	349.9	-1.23	33.5	1.7	4.07	10.03	250.3	1.70	74.4	25.7	10.59
46720.0	1986 OCT 16.5	1.00	22.5	0.0	200.8	-8.8	4.97	350.8	-1.23	34.4	1.7	4.15	10.03	250.6	1.69	74.7	25.7	10.72
46730.0	1986 OCT 26.5	0.99	32.4	0.0	210.2	-12.3	4.97	351.7	-1.24	35.3	1.8	4.26	10.03	250.9	1.68	75.1	25.8	10.82
46740.0	1986 NOV 5.5	0.99	42.4	0.0	220.0	-15.4	4.97	352.6	-1.25	36.2	1.8	4.39	10.03	251.2	1.67	75.4	25.8	10.91
46750.0	1986 NOV 15.5	0.99	52.5	0.0	230.1	-18.4	4.96	353.5	-1.25	37.1	1.9	4.53	10.03	251.5	1.66	75.7	25.8	10.97
46760.0	1986 NOV 25.5	0.99	62.6	0.0	240.5	-20.7	4.96	354.4	-1.26	38.0	1.9	4.69	10.03	251.8	1.65	76.1	25.9	11.01
46770.0	1986 DEC 5.5	0.99	72.7	0.0	251.3	-22.3	4.96	355.3	-1.26	38.9	1.9	4.84	10.03	252.1	1.64	76.4	25.9	11.02
46780.0	1986 DEC 15.5	0.98	82.9	0.0	262.2	-23.3	4.96	356.3	-1.27	39.8	2.0	5.00	10.03	252.4	1.63	76.7	25.9	11.00
46790.0	1986 DEC 25.5	0.98	93.0	0.0	273.3	-23.4	4.96	357.2	-1.27	40.8	2.0	5.15	10.04	252.7	1.62	77.1	26.0	10.96
46800.0	1987 JAN 4.5	0.98	103.2	0.0	284.4	-22.8	4.96	358.1	-1.28	41.7	2.0	5.30	10.04	253.0	1.61	77.4	26.0	10.90
46810.0	1987 JAN 14.5	0.98	113.4	0.0	295.3	-21.4	4.96	359.0	-1.28	42.6	2.1	5.44	10.04	253.3	1.60	77.7	26.0	10.81
46820.0	1987 JAN 24.5	0.98	123.6	0.0	305.9	-19.4	4.96	359.9	-1.28	43.5	2.1	5.56	10.04	253.6	1.59	78.1	26.1	10.70
46830.0	1987 FEB 3.5	0.99	133.8	0.0	316.2	-16.7	4.95	0.8	-1.29	44.4	2.1	5.67	10.04	253.9	1.58	78.4	26.1	10.57
46840.0	1987 FEB 13.5	0.99	143.9	0.0	326.2	-13.6	4.95	1.7	-1.29	45.3	2.2	5.77	10.04	254.2	1.57	78.7	26.1	10.42
46850.0	1987 FEB 23.5	0.99	154.0	0.0	335.9	-10.1	4.96	2.7	-1.29	46.2	2.2	5.84	10.04	254.5	1.56	79.1	26.1	10.27
46860.0	1987 MAR 5.5	0.99	164.0	0.0	345.3	-6.3	4.95	3.6	-1.30	47.2	2.2	5.90	10.04	254.8	1.55	79.4	26.2	10.10
46870.0	1987 MAR 15.5	0.99	174.0	0.0	354.5	-2.4	4.95	4.5	-1.30	48.1	2.3	5.93	10.04	255.1	1.54	79.7	26.2	9.94
46880.0	1987 MAR 25.5	1.00	183.9	0.0	3.6	1.5	4.95	5.4	-1.30	49.0	2.3	5.95	10.04	255.4	1.53	80.1	26.2	9.77
46890.0	1987 APR 4.5	1.00	193.8	0.0	12.7	5.5	4.95	6.3	-1.30	49.9	2.3	5.95	10.05	255.7	1.52	80.4	26.2	9.61
46900.0	1987 APR 14.5	1.00	203.6	0.0	21.9	9.2	4.95	7.2	-1.30	50.8	2.4	5.92	10.05	256.0	1.51	80.7	26.3	9.47
46910.0	1987 APR 24.5	1.01	213.4	0.0	31.2	12.7	4.95	8.1	-1.30	51.7	2.4	5.88	10.05	256.3	1.50	81.1	26.3	9.34
46920.0	1987 MAY 4.5	1.01	223.1	0.0	40.7	15.8	4.95	9.1	-1.31	52.6	2.4	5.81	10.05	256.6	1.49	81.4	26.3	9.22
46930.0	1987 MAY 14.5	1.01	232.8	0.0	50.4	18.5	4.95	10.0	-1.31	53.6	2.5	5.73	10.05	256.9	1.48	81.7	26.3	9.14
46940.0	1987 MAY 24.5	1.01	242.4	0.0	60.4	20.7	4.95	10.9	-1.31	54.5	2.5	5.64	10.05	257.2	1.47	82.1	26.3	9.07
46950.0	1987 JUN 3.5	1.01	252.0	0.0	70.5	22.2	4.95	11.8	-1.30	55.4	2.5	5.53	10.05	257.5	1.46	82.4	26.4	9.04
46960.0	1987 JUN 13.5	1.02	261.6	0.0	80.9	23.2	4.95	12.7	-1.30	56.3	2.6	5.40	10.05	257.8	1.45	82.7	26.4	9.04
46970.0	1987 JUN 23.5	1.02	271.1	0.0	91.2	23.4	4.95	13.6	-1.30	57.2	2.6	5.27	10.05	258.1	1.44	83.1	26.4	9.06
46980.0	1987 JUL 3.5	1.02	280.7	0.0	101.6	23.0	4.95	14.6	-1.30	58.2	2.6	5.12	10.05	258.4	1.43	83.4	26.4	9.12
46990.0	1987 JUL 13.5	1.02	290.2	0.0	111.9	21.9	4.95	15.5	-1.30	59.1	2.6	4.97	10.05	258.7	1.41	83.8	26.4	9.20
47000.0	1987 JUL 23.5	1.02	299.7	0.0	121.9	20.2	4.95	16.4	-1.30	60.0	2.7	4.82	10.05	259.0	1.40	84.1	26.4	9.31
47010.0	1987 AUG 2.5	1.01	309.3	0.0	131.7	17.9	4.95	17.3	-1.29	60.9	2.7	4.67	10.05	259.3	1.39	84.4	26.4	9.43
47020.0	1987 AUG 12.5	1.01	318.9	0.0	141.3	15.2	4.95	18.2	-1.29	61.8	2.7	4.52	10.06	259.6	1.38	84.8	26.5	9.58
47030.0	1987 AUG 22.5	1.01	328.5	0.0	150.7	12.0	4.95	19.1	-1.29	62.7	2.7	4.38	10.06	259.9	1.37	85.1	26.5	9.73
47040.0	1987 SEP 1.5	1.01	338.1	0.0	159.8	8.5	4.95	20.1	-1.29	63.7	2.7	4.26	10.06	260.2	1.36	85.4	26.5	9.90
47050.0	1987 SEP 11.5	1.01	347.8	0.0	168.8	4.8	4.95	21.0	-1.28	64.6	2.8	4.15	10.06	260.5	1.35	85.8	26.5	10.06
47060.0	1987 SEP 21.5	1.00	357.6	0.0	177.8	1.0	4.95	21.9	-1.28	65.5	2.8	4.06	10.06	260.8	1.34	86.1	26.5	10.23
47070.0	1987 OCT 1.5	1.00	7.4	0.0	186.8	-2.9	4.95	22.8	-1.27	66.4	2.8	4.00	10.06	261.1	1.33	86.4	26.5	10.38
47080.0	1987 OCT 11.5	1.00	17.3	0.0	195.9	-6.8	4.95	23.7	-1.27	67.3	2.8	3.96	10.06	261.4	1.32	86.8	26.5	10.53
47090.0	1987 OCT 21.5	1.00	27.2	0.0	205.2	-10.5	4.95	24.6	-1.26	68.2	2.8	3.96	10.06	261.7	1.31	87.1	26.5	10.67
47100.0	1987 NOV 0.5	0.99	37.1	0.0	214.8	-13.9	4.96	25.6	-1.26	69.2	2.9	3.99	10.06	262.0	1.29	87.4	26.5	10.79
47110.0	1987 NOV 10.5	0.99	47.2	0.0	224.7	-17.0	4.95	26.5	-1.25	70.1	2.9	4.05	10.06	262.3	1.28	87.8	26.5	10.89
47120.0	1987 NOV 20.5	0.99	57.2	0.0	235.0	-19.6	4.96	27.4	-1.25	71.0	2.9	4.13	10.06	262.6	1.27	88.1	26.5	10.96
47130.0	1987 DEC 0.5	0.99	67.4	0.0	245.6	-21.6	4.96	28.3	-1.24	71.9	2.9	4.24	10.06	262.9	1.26	88.5	26.5	11.02
47140.0	1987 DEC 10.5	0.98	77.5	0.0	256.4	-22.9	4.96	29.2	-1.23	72.8	2.9	4.37	10.06	263.2	1.25	88.8	26.6	11.04
47150.0	1987 DEC 20.5	0.98	87.7	0.0	267.5	-23.4	4.96	30.1	-1.23	73.7	2.9	4.51	10.06	263.5	1.24	89.1	26.6	11.04
47160.0	1987 DEC 30.5	0.98	97.9	0.0	278.5	-23.2	4.96	31.0	-1.22	74.6	3.0	4.66	10.06	263.8	1.23	89.5	26.6	11.02
47170.0	1988 JAN 9.5	0.98	108.1	0.0	289.6	-22.2	4.96	32.0	-1.21	75.6	3.0	4.82	10.06	264.1	1.22	89.8	26.6	10.97
47180.0	1988 JAN 19.5	0.98	118.2	0.0	300.4	-20.5	4.96	32.9	-1.20	76.5	3.0	4.98	10.06	264.4	1.20	90.1	26.6	10.90
47190.0	1988 JAN 29.5	0.98	128.4	0.0	310.9	-18.2	4.96	33.8	-1.19	77.4	3.0	5.14	10.06	264.7	1.19	90.5	26.6	10.80
47200.0	1988 FEB 8.5	0.99	138.6	0.0	321.0	-15.3	4.97	34.7	-1.19	78.3	3.0	5.29	10.07	265.0	1.18	90.8	26.6	10.68
47210.0	1988 FEB 18.5	0.99	148.7	0.0	330.8	-11.9	4.97	35.6	-1.18	79.2	3.0	5.43	10.07	265.3	1.17	91.1	26.6	10.55
47220.0	1988 MAR 0.5	0.99	158.7	0.0	340.4	-8.3	4.97	36.5	-1.17	80.1	3.0	5.56	10.07	265.6	1.16	91.5	26.5	10.40
47230.0	1988 MAR 9.5	0.99	168.8	0.0	349.7	-4.4	4.97	37.4	-1.16	81.0	3.0	5.68	10.07	265.9	1.15	91.8	26.5	10.24
47240.0	1988 MAR 19.5	1.00	178.7	0.0	358.8	-0.5	4.97	38.3	-1.15	81.9	3.0	5.77	10.07	266.2	1.14	92.1	26.5	10.07
47250.0	1988 MAR 29.5	1.00	188.6	0.0	7.9	3.4	4.97	39.2	-1.14	82.8	3.0	5.85	10.07	266.5	1.12	92.5	26.5	9.91
47260.0	1988 APR 8.5	1.00	198.5	0.0	17.1	7.3	4.97	40.1	-1.13	83.8	3.0	5.92	10.07	266.8	1.11	92.8	26.5	9.74
47270.0	1988 APR 18.5	1.00	208.3	0.0	26.3	10.9	4.98	41.1	-1.12	84.7	3.1	5.96	10.07	267.1	1.10	93.1	26.5	9.59
47280.0	1988 APR 28.5	1.01	218.0	0.0	35.7	14.2	4.98	42.0	-1.11	85.6	3.1	5.98	10.07	267.4	1.09	93.5	26.5	9.44
47290.0	1988 MAY 8.5	1.01	227.7	0.0	45.3	17.1	4.98	42.9	-1.10	86.5	3.1	5.99	10.07	267.7	1.08	93.8	26.5	9.32

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
46450.0	1986 JAN 19.5	19.11	258.3	-0.06	254.9	81.8	19.87	30.23	273.1	1.10	262.4	-28.6	31.12	29.66	215.0	16.61	170.2	0.0	29.77
46460.0	1986 JAN 29.5	19.11	258.5	-0.06	254.1	81.8	19.76	30.23	273.2	1.10	262.5	-28.6	31.03	29.66	215.1	16.60	170.3	0.0	29.61
46470.0	1986 FEB 8.5	19.12	258.6	-0.06	253.3	81.8	19.62	30.23	273.2	1.09	262.5	-28.6	30.92	29.65	215.1	16.60	170.3	0.0	29.44
46480.0	1986 FEB 18.5	19.12	258.7	-0.07	252.5	81.7	19.47	30.23	273.3	1.09	262.6	-28.6	30.79	29.65	215.2	16.59	170.4	0.0	29.28
46490.0	1986 MAR 0.5	19.12	258.8	-0.07	251.7	81.7	19.31	30.23	273.4	1.09	262.7	-28.6	30.64	29.65	215.3	16.59	170.5	0.0	29.13
46500.0	1986 MAR 10.5	19.12	258.9	-0.07	250.9	81.7	19.14	30.23	273.4	1.09	262.7	-28.6	30.48	29.65	215.3	16.58	170.5	0.0	29.00
46510.0	1986 MAR 20.5	19.12	259.0	-0.07	250.2	81.6	18.97	30.22	273.5	1.09	262.8	-28.6	30.31	29.65	215.4	16.58	170.6	0.0	28.89
46520.0	1986 MAR 30.5	19.13	259.2	-0.07	249.4	81.6	18.81	30.22	273.5	1.09	262.9	-28.6	30.14	29.65	215.5	16.57	170.7	0.0	28.79
46530.0	1986 APR 9.5	19.13	259.3	-0.07	248.7	81.5	18.65	30.22	273.6	1.09	262.9	-28.6	29.97	29.65	215.6	16.57	170.7	0.0	28.73
46540.0	1986 APR 19.5	19.13	259.4	-0.08	247.9	81.5	18.51	30.22	273.7	1.08	263.0	-28.6	29.81	29.65	215.6	16.56	170.8	0.0	28.69
46550.0	1986 APR 29.5	19.13	259.5	-0.08	247.2	81.5	18.38	30.22	273.7	1.08	263.1	-28.6	29.66	29.64	215.7	16.56	170.9	0.0	28.68
46560.0	1986 MAY 9.5	19.13	259.6	-0.08	246.4	81.4	18.28	30.22	273.8	1.08	263.1	-28.6	29.53	29.64	215.8	16.55	170.9	0.0	28.70
46570.0	1986 MAY 19.5	19.13	259.7	-0.08	245.7	81.4	18.20	30.22	273.8	1.08	263.2	-28.6	29.41	29.64	215.8	16.54	171.0	0.0	28.75
46580.0	1986 MAY 29.5	19.14	259.9	-0.08	245.0	81.3	18.15	30.22	273.9	1.08	263.3	-28.6	29.32	29.64	215.9	16.54	171.1	0.0	28.82
46590.0	1986 JUN 8.5	19.14	260.0	-0.08	244.3	81.3	18.13	30.22	273.9	1.08	263.3	-28.6	29.25	29.64	216.0	16.53	171.1	0.0	28.92
46600.0	1986 JUN 18.5	19.14	260.1	-0.08	243.6	81.2	18.13	30.22	274.0	1.08	263.4	-28.6	29.22	29.64	216.1	16.53	171.2	0.0	29.03
46610.0	1986 JUN 28.5	19.14	260.2	-0.09	242.9	81.2	18.17	30.22	274.1	1.07	263.5	-28.6	29.21	29.64	216.1	16.52	171.3	0.0	29.16
46620.0	1986 JUL 8.5	19.14	260.3	-0.09	242.2	81.1	18.23	30.22	274.1	1.07	263.5	-28.6	29.23	29.64	216.2	16.52	171.4	0.0	29.31
46630.0	1986 JUL 18.5	19.15	260.5	-0.09	241.6	81.1	18.32	30.22	274.2	1.07	263.6	-28.6	29.28	29.64	216.3	16.51	171.4	0.0	29.47
46640.0	1986 JUL 28.5	19.15	260.6	-0.09	240.9	81.0	18.43	30.22	274.2	1.07	263.7	-28.7	29.35	29.64	216.3	16.51	171.5	0.0	29.63
46650.0	1986 AUG 7.5	19.15	260.7	-0.09	240.3	80.9	18.57	30.22	274.3	1.07	263.7	-28.7	29.45	29.63	216.4	16.50	171.6	0.0	29.78
46660.0	1986 AUG 17.5	19.15	260.8	-0.09	239.6	80.9	18.72	30.22	274.4	1.07	263.8	-28.7	29.58	29.63	216.5	16.49	171.6	0.0	29.94
46670.0	1986 AUG 27.5	19.15	260.9	-0.10	239.0	80.8	18.88	30.22	274.4	1.07	263.9	-28.7	29.72	29.63	216.6	16.49	171.7	0.0	30.09
46680.0	1986 SEP 6.5	19.16	261.0	-0.10	238.3	80.8	19.04	30.22	274.5	1.06	264.0	-28.7	29.87	29.63	216.6	16.48	171.8	0.0	30.22
46690.0	1986 SEP 16.5	19.16	261.2	-0.10	237.7	80.7	19.22	30.22	274.5	1.06	264.0	-28.7	30.04	29.63	216.7	16.48	171.8	0.0	30.34
46700.0	1986 SEP 26.5	19.16	261.3	-0.10	237.1	80.6	19.38	30.22	274.6	1.06	264.1	-28.7	30.21	29.63	216.8	16.47	171.9	0.0	30.43
46710.0	1986 OCT 6.5	19.16	261.4	-0.10	236.5	80.6	19.54	30.22	274.7	1.06	264.2	-28.7	30.37	29.63	216.8	16.46	172.0	0.0	30.51
46720.0	1986 OCT 16.5	19.16	261.5	-0.10	235.9	80.5	19.69	30.22	274.7	1.06	264.2	-28.7	30.54	29.63	216.9	16.46	172.0	0.0	30.55
46730.0	1986 OCT 26.5	19.16	261.6	-0.11	235.3	80.4	19.83	30.22	274.8	1.06	264.3	-28.7	30.69	29.63	217.0	16.45	172.1	0.0	30.58
46740.0	1986 NOV 5.5	19.17	261.7	-0.11	234.7	80.4	19.94	30.22	274.8	1.06	264.4	-28.7	30.83	29.62	217.1	16.45	172.2	0.0	30.57
46750.0	1986 NOV 15.5	19.17	261.9	-0.11	234.2	80.3	20.04	30.22	274.9	1.05	264.4	-28.7	30.96	29.62	217.1	16.44	172.2	0.0	30.54
46760.0	1986 NOV 25.5	19.17	262.0	-0.11	233.6	80.2	20.10	30.22	275.0	1.05	264.5	-28.7	31.06	29.62	217.2	16.44	172.3	0.0	30.48
46770.0	1986 DEC 5.5	19.17	262.1	-0.11	233.1	80.2	20.14	30.22	275.0	1.05	264.6	-28.7	31.13	29.62	217.3	16.43	172.4	0.0	30.40
46780.0	1986 DEC 15.5	19.17	262.2	-0.11	232.5	80.1	20.16	30.22	275.1	1.05	264.6	-28.7	31.18	29.62	217.3	16.42	172.4	0.0	30.29
46790.0	1986 DEC 25.5	19.18	262.3	-0.11	232.0	80.0	20.14	30.22	275.1	1.05	264.7	-28.7	31.20	29.62	217.4	16.42	172.5	0.0	30.16
46800.0	1987 JAN 4.5	19.18	262.5	-0.12	231.4	80.0	20.10	30.22	275.2	1.05	264.8	-28.7	31.19	29.62	217.5	16.41	172.6	0.0	30.02
46810.0	1987 JAN 14.5	19.18	262.6	-0.12	230.9	79.9	20.03	30.22	275.3	1.05	264.8	-28.7	31.15	29.62	217.5	16.40	172.6	0.0	29.86
46820.0	1987 JAN 24.5	19.18	262.7	-0.12	230.4	79.8	19.94	30.22	275.3	1.04	264.9	-28.7	31.09	29.62	217.6	16.40	172.7	0.0	29.70
46830.0	1987 FEB 3.5	19.18	262.8	-0.12	229.9	79.7	19.82	30.22	275.4	1.04	265.0	-28.7	31.00	29.62	217.7	16.39	172.8	0.0	29.53
46840.0	1987 FEB 13.5	19.19	262.9	-0.12	229.4	79.7	19.68	30.22	275.4	1.04	265.0	-28.7	30.88	29.62	217.8	16.39	172.9	0.0	29.37
46850.0	1987 FEB 23.5	19.19	263.0	-0.12	228.9	79.6	19.53	30.22	275.5	1.04	265.1	-28.7	30.75	29.61	217.8	16.38	172.9	0.0	29.21
46860.0	1987 MAR 5.5	19.19	263.2	-0.13	228.4	79.5	19.37	30.22	275.5	1.04	265.2	-28.7	30.60	29.61	217.9	16.37	173.0	0.0	29.06
46870.0	1987 MAR 15.5	19.19	263.3	-0.13	227.9	79.4	19.20	30.22	275.6	1.04	265.2	-28.7	30.43	29.61	218.0	16.37	173.1	0.0	28.94
46880.0	1987 MAR 25.5	19.19	263.4	-0.13	227.4	79.4	19.04	30.22	275.7	1.03	265.3	-28.7	30.26	29.61	218.0	16.36	173.1	0.0	28.83
46890.0	1987 APR 4.5	19.19	263.5	-0.13	227.0	79.3	18.87	30.22	275.7	1.03	265.4	-28.7	30.09	29.61	218.1	16.36	173.2	0.0	28.74
46900.0	1987 APR 14.5	19.20	263.6	-0.13	226.5	79.2	18.71	30.22	275.8	1.03	265.4	-28.7	29.92	29.61	218.2	16.35	173.3	0.0	28.68
46910.0	1987 APR 24.5	19.20	263.7	-0.13	226.1	79.1	18.57	30.22	275.8	1.03	265.5	-28.7	29.76	29.61	218.3	16.34	173.3	0.0	28.55
46920.0	1987 MAY 4.5	19.20	263.9	-0.14	225.6	79.0	18.45	30.22	275.9	1.03	265.6	-28.7	29.62	29.61	218.3	16.34	173.4	0.0	28.65
46930.0	1987 MAY 14.5	19.20	264.0	-0.14	225.2	79.0	18.34	30.22	276.0	1.03	265.6	-28.7	29.49	29.61	218.4	16.33	173.5	0.0	28.57
46940.0	1987 MAY 24.5	19.20	264.1	-0.14	224.7	78.9	18.27	30.22	276.0	1.03	265.7	-28.7	29.38	29.61	218.5	16.32	173.5	0.0	28.72
46950.0	1987 JUN 3.5	19.21	264.2	-0.14	224.3	78.8	18.22	30.22	276.1	1.02	265.8	-28.7	29.29	29.61	218.5	16.32	173.6	0.0	28.80
46960.0	1987 JUN 13.5	19.21	264.3	-0.14	223.9	78.7	18.19	30.22	276.1	1.02	265.8	-28.7	29.23	29.61	218.6	16.31	173.7	0.0	28.90
46970.0	1987 JUN 23.5	19.21	264.4	-0.14	223.5	78.6	18.20	30.22	276.2	1.02	265.9	-28.7	29.20	29.60	218.7	16.30	173.7	0.0	29.02
46980.0	1987 JUL 3.5	19.21	264.6	-0.14	223.1	78.5	18.24	30.22	276.3	1.02	266.0	-28.7	29.20	29.60	218.8	16.30	173.8	0.0	29.16
46990.0	1987 JUL 13.5	19.21	264.7	-0.15	222.7	78.5	18.30	30.21	276.3	1.02	266.0	-28.7	29.23	29.60	218.8	16.29	173.9	0.0	29.31
47000.0	1987 JUL 23.5	19.21	264.8	-0.15	222.3	78.4	18.39	30.21	276.4	1.02	266.1	-28.7	29.28	29.60	218.9	16.28	173.9	0.0	29.46
47010.0	1987 AUG 2.5	19.22	264.9	-0.15	221.9	78.3	18.50	30.21	276.4	1.02	266.2	-28.7	29.37	29.60	219.0	16.28	174.0	0.0	29.52
47020.0	1987 AUG 12.5	19.22	265.0	-0.15	221.5	78.2	18.64	30.21	276.5	1.01	266.2	-28.7	29.47	29.60	219.0	16.27	174.1	0.0	29.78
47030.0	1987 AUG 22.5	19.22	265.1	-0.15	221.1	78.1	18.79	30.21	276.6	1.01	266.3	-28.7	29.60	29.60	219.1	16.26	174.2	0.0	29.94
47040.0	1987 SEP 1.5	19.22	265.3	-0.15	220.7	78.0	18.95	30.21	276.6	1.01	266.4	-28.8	29.75	29.60	219.2	16.26	174.2	0.0	30.08
47050.0	1987 SEP 11.5	19.22	265.4	-0.16	220.4	77.9	19.12	30.21	276.7	1.01	266.4	-28.8	29.90	29.60	219.3	16.25	174.3	0.0	30.21
47060.0	1987 SEP 21.5	19.23	265.5	-0.16	220.0	77.8	19.29	30.21	276.7	1.01	266.5	-28.8	30.07	29.60	219.3	16.24	174.4	0.0	30.33
47070.0	1987 OCT 1.5	19.23	265.6	-0.16	219.6	77.8	19.46	30.21	276.8	1.01	266.6	-28.8	30.24	29.60	219.4	16.24	174.4	0.0	30.42
47080.0	1987 OCT 11.5	19.23	265.7	-0.16	219.3	77.7	19.62	30.21	276.8	1.00	266.6	-28.8	30.41	29.60	219.5	16.23	174.5	0.0	30.49
47090.0	1987 OCT 21.5	19.23	265.8	-0.16	218.9	77.6	19.77	30.21	276.9	1.00	266.7	-28.8	30.57	29.60	219.5	16.22	174.6	0.0	30.53
47100.0	1987 NOV 0.5	19.23	266.0	-0.16	218.6	77.5	19.90	30.21	277.0	1.00	266.8	-28.8	30.72	29.60	219.6	16.22	174.6	0.0	30.55
47110.0	1987 NOV 10.5	19.24	266.1	-0.16	218.3	77.4	20.02	30.21	277.0	1.00	266.9	-28.8	30.86	29.60	219.7	16.21	174.7	0.0	30.54
47120.0	1987 NOV 20.5	19.24	266.2	-0.17	217.9	77.3	20.11	30.21	277.1	1.00	266.9	-28.8	30.98	29.59	219.7	16.20	174.8	0.0	30.50
47130.0	1987 DEC 0.5	19.24	266.3	-0.17	217.6	77.2	20.17	30.21	277.1	1.00	267.0	-28.8	31.07	29.59	219.8	16.20	174.8	0.0	30.44
47140.0	1987 DEC 10.5	19.24	266.4	-0.17	217.3	77.1	20.21	30.21	277.2	1.00	267.1	-28.8	31.14	29.59	219.9	16.19	174.9	0.0	30.35
47150.0	1987 DEC 20.5	19.24	266.5	-0.17	217.0	77.0	20.23	30.21	277.3	0.99	267.1	-28.8	31.18	29.59	220.0	16.18	175.0	0.0	30.24
47160.0	1987 DEC 30.5	19.24	266.7	-0.17	216.5	75.9	20.21	30.21	277.3	0.99	267.2	-28.8	31.19	29.59	220.0	16.18	175.0	0.0	30.11
47170.0	1988 JAN 9.5	19.25	266.8	-0.17	216.3	75.8	20.17	30.21	277.4	0.99	267.3	-28.8	31.18	29.59	220.1	16.17	175.1	0.0	29.96
47180.0	1988 JAN 19.5	19.25	266.9	-0.18	216.0	75.8	20.09	30.21	277.4	0.99	267.3	-28.8	31.13	29.59	220.2	16.16	175.2	0.0	29.80
47190.0	1988 JAN 29.5	19.25	267.0	-0.18	215.7	75.7	20.00	30.21	277.5	0.99	267.4	-28.8	31.06	29.59	220.2	16.16	175.2	0.0	29.64
47200.0	1988 FEB 8.5	19.25	267.1	-0.18	215.4	75.6	19.88	30.21	277.6	0.99	267.5	-28.8	30.96	29.59	220.3	16.15	175.3	0.0	29.47
47210.0	1988 FEB 18.5	19.25	267.2	-0.18	215.1	75.5	19.75	30.21	277.6	0.98	267.5	-28.8	30.84	29.59	220.4	16.14	175.4	0.0	29.31
47220.0	1988 MAR 0.5	19.26	267.4	-0.18	214.8	76.4	19.59	30.21	277.7	0.98	267.6	-28.8	30.70	29.59	220.5	16.13	175.5	0.0	29.15
47230.0	1988 MAR 9.5	19.26	267.5	-0.18	214.6	76.3	19.43	30.21	277.7	0.98	267.7	-28.8	30.55	29.59	220.5	16.13	175.5	0.0	29.01
47240.0	1988 MAR 19.5	19.26	267.6	-0.18	214.3	76.2	19.27	30.21	277.8	0.98	267.7	-28.8	30.38	29.59	220.6	16.12	175.6	0.0	28.88
47250.0	1988 MAR 29.5	19.26	267.7	-0.19	214.0	75.1	19.10	30.21	277.9	0.98	267.8	-28.8	30.21	29.59	220.7	16.11	175.7	0.0	28.78
47260.0	1988 APR 8.5	19.26	267.8	-0.19	213.7	75.0	18.93	30.21	277.9	0.98	267.9	-28.8	30.04	29.59	220.7	16.11	175.7	0.0	28.70
47270.0	1988 APR 18.5	19.26	267.9	-0.19	213.5	75.9	18.78	30.21	278.0	0.98	267.9	-28.8	29.88	29.59	220.8	16.10	175.8	0.0	28.65
47280.0	1988 APR 28.5	19.27	268.1	-0.19	213.2	75.8	18.64	30.21	278.0	0.97	268.0	-28.8	29.72	29.59	220.9	16.09	175.9	0.0	28.62
47290.0	1988 MAY 8.5	19.27	268.2	-0.19	212.9	75.7	18.51	30.21	278.1	0.97	268.1	-28.8	29.57	29.58	221.0	16.08	175.9	0.0	28.62

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER COIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN COIST
47300.0	1988 MAY 18.5	1.01	237.4	0.0	55.1	19.5	4.98	43.8	-1.09	87.4	3.1	5.97	10.07	268.0	1.06	94.2	26.5	9.21
47310.0	1988 MAY 28.5	1.01	247.0	0.0	65.2	21.5	4.98	44.7	-1.07	88.3	3.1	5.93	10.07	268.3	1.05	94.5	26.5	9.13
47320.0	1988 JUN 7.5	1.02	256.6	0.0	75.4	22.8	4.99	45.6	-1.06	89.2	3.1	5.88	10.07	268.6	1.04	94.8	26.5	9.08
47330.0	1988 JUN 17.5	1.02	266.1	0.0	85.8	23.4	4.99	46.5	-1.05	90.1	3.1	5.81	10.07	268.9	1.03	95.2	26.5	9.05
47340.0	1988 JUN 27.5	1.02	275.6	0.0	96.2	23.3	4.99	47.4	-1.04	91.0	3.1	5.72	10.07	269.2	1.02	95.5	26.5	9.05
47350.0	1988 JUL 7.5	1.02	285.2	0.0	106.5	22.6	4.99	48.3	-1.03	91.9	3.1	5.61	10.07	269.5	1.01	95.8	26.4	9.09
47360.0	1988 JUL 17.5	1.02	294.7	0.0	116.7	21.2	4.99	49.2	-1.01	92.8	3.1	5.49	10.07	269.8	0.99	96.2	26.4	9.16
47370.0	1988 JUL 27.5	1.02	304.3	0.0	126.6	19.2	5.00	50.1	-1.00	93.7	3.1	5.36	10.07	270.1	0.98	96.5	26.4	9.25
47380.0	1988 AUG 6.5	1.01	313.8	0.0	136.3	16.7	5.00	51.0	-0.99	94.6	3.1	5.22	10.07	270.4	0.97	96.8	26.4	9.36
47390.0	1988 AUG 16.5	1.01	323.4	0.0	145.8	13.7	5.00	51.9	-0.97	95.5	3.1	5.08	10.07	270.7	0.96	97.2	26.4	9.49
47400.0	1988 AUG 26.5	1.01	333.1	0.0	155.0	10.4	5.00	52.8	-0.96	96.4	3.0	4.92	10.07	271.0	0.95	97.5	26.4	9.64
47410.0	1988 SEP 5.5	1.01	342.7	0.0	164.1	5.3	5.00	53.7	-0.94	97.3	3.0	4.77	10.07	271.3	0.93	97.8	25.3	9.80
47420.0	1988 SEP 15.5	1.01	352.5	0.0	173.1	3.0	5.01	54.6	-0.93	98.2	3.0	4.62	10.07	271.6	0.92	98.2	26.3	9.96
47430.0	1988 SEP 25.5	1.00	2.2	0.0	182.1	-0.9	5.01	55.5	-0.92	99.1	3.0	4.48	10.07	271.9	0.91	98.5	26.3	10.13
47440.0	1988 OCT 5.5	1.00	12.1	0.0	191.1	-4.8	5.01	56.4	-0.90	100.0	3.0	4.35	10.07	272.2	0.90	98.8	26.3	10.29
47450.0	1988 OCT 15.5	1.00	22.0	0.0	200.3	-8.6	5.01	57.3	-0.89	100.9	3.0	4.24	10.07	272.5	0.89	99.2	26.3	10.44
47460.0	1988 OCT 25.5	0.99	31.9	0.0	209.7	-12.1	5.02	58.2	-0.87	101.8	3.0	4.15	10.07	272.8	0.87	99.5	26.2	10.59
47470.0	1988 NOV 4.5	0.99	41.9	0.0	219.5	-15.4	5.02	59.1	-0.86	102.7	3.0	4.08	10.07	273.1	0.86	99.8	26.2	10.72
47480.0	1988 NOV 14.5	0.99	51.9	0.0	229.5	-18.3	5.02	59.9	-0.84	103.6	3.0	4.05	10.07	273.4	0.85	100.2	26.2	10.83
47490.0	1988 NOV 24.5	0.99	62.0	0.0	240.0	-20.4	5.03	60.8	-0.83	104.5	3.0	4.04	10.07	273.7	0.84	100.5	26.2	10.92
47500.0	1988 DEC 4.5	0.99	72.2	0.0	250.7	-22.3	5.03	61.7	-0.81	105.4	3.0	4.06	10.07	274.0	0.82	100.8	26.1	10.99
47510.0	1988 DEC 14.5	0.98	82.3	0.0	261.7	-23.2	5.03	62.6	-0.79	106.3	2.9	4.12	10.07	274.3	0.81	101.2	26.1	11.03
47520.0	1988 DEC 24.5	0.98	92.5	0.0	272.8	-23.4	5.03	63.5	-0.78	107.1	2.9	4.20	10.07	274.6	0.80	101.5	26.1	11.05
47530.0	1989 JAN 3.5	0.98	102.7	0.0	283.8	-22.8	5.04	64.4	-0.76	108.0	2.9	4.31	10.07	274.9	0.79	101.8	26.1	11.04
47540.0	1989 JAN 13.5	0.98	112.9	0.0	294.7	-21.5	5.04	65.3	-0.74	108.9	2.9	4.44	10.07	275.2	0.77	102.2	26.0	11.01
47550.0	1989 JAN 23.5	0.98	123.1	0.0	305.4	-19.5	5.04	66.2	-0.73	109.8	2.9	4.58	10.07	275.5	0.76	102.5	26.0	10.95
47560.0	1989 FEB 2.5	0.99	133.2	0.0	315.7	-15.9	5.04	67.0	-0.71	110.7	2.9	4.73	10.07	275.8	0.75	102.8	26.0	10.87
47570.0	1989 FEB 12.5	0.99	143.4	0.0	325.7	-13.7	5.05	67.9	-0.69	111.6	2.9	4.89	10.07	276.1	0.74	103.2	26.0	10.76
47580.0	1989 FEB 22.5	0.99	153.5	0.0	335.4	-10.2	5.05	68.8	-0.68	112.4	2.8	5.06	10.07	276.4	0.73	103.5	25.9	10.64
47590.0	1989 MAR 4.5	0.99	163.5	0.0	344.8	-6.5	5.05	69.7	-0.66	113.3	2.8	5.21	10.07	276.7	0.71	103.8	25.9	10.50
47600.0	1989 MAR 14.5	0.99	173.5	0.0	354.0	-2.6	5.06	70.6	-0.64	114.2	2.8	5.37	10.07	277.0	0.70	104.2	25.9	10.35
47610.0	1989 MAR 24.5	1.00	183.4	0.0	3.2	1.4	5.06	71.4	-0.63	115.1	2.8	5.51	10.07	277.3	0.69	104.5	25.8	10.18
47620.0	1989 APR 3.5	1.00	193.3	0.0	12.3	5.3	5.06	72.3	-0.61	116.0	2.8	5.64	10.07	277.6	0.68	104.8	25.8	10.02
47630.0	1989 APR 13.5	1.00	203.1	0.0	21.4	9.0	5.07	73.2	-0.59	116.8	2.7	5.76	10.07	277.9	0.66	105.1	25.8	9.85
47640.0	1989 APR 23.5	1.01	212.9	0.0	30.7	12.5	5.07	74.1	-0.57	117.7	2.7	5.86	10.07	278.2	0.65	105.5	25.7	9.69
47650.0	1989 MAY 3.5	1.01	222.6	0.0	40.2	15.6	5.07	74.9	-0.55	118.6	2.7	5.95	10.07	278.5	0.64	105.8	25.7	9.54
47660.0	1989 MAY 13.5	1.01	232.3	0.0	49.9	18.4	5.08	75.8	-0.54	119.5	2.7	6.02	10.07	278.8	0.62	106.1	25.6	9.40
47670.0	1989 MAY 23.5	1.01	241.9	0.0	59.8	20.6	5.08	76.7	-0.52	120.3	2.6	6.06	10.07	279.1	0.61	106.5	25.6	9.28
47680.0	1989 JUN 2.5	1.01	251.5	0.0	70.0	22.2	5.08	77.6	-0.50	121.2	2.6	6.09	10.07	279.4	0.60	106.8	25.6	9.18
47690.0	1989 JUN 12.5	1.02	261.1	0.0	80.3	23.2	5.09	78.4	-0.48	122.1	2.6	6.10	10.07	279.7	0.59	107.1	25.5	9.11
47700.0	1989 JUN 22.5	1.02	270.6	0.0	90.7	23.4	5.09	79.3	-0.46	122.9	2.6	6.09	10.06	280.0	0.57	107.5	25.5	9.06
47710.0	1989 JUL 2.5	1.02	280.2	0.0	101.1	23.1	5.09	80.2	-0.44	123.8	2.5	6.06	10.06	280.3	0.55	107.8	25.5	9.05
47720.0	1989 JUL 12.5	1.02	289.7	0.0	111.3	22.0	5.10	81.0	-0.43	124.7	2.5	6.01	10.06	280.6	0.55	108.1	25.4	9.06
47730.0	1989 JUL 22.5	1.02	299.2	0.0	121.4	20.3	5.10	81.9	-0.41	125.5	2.5	5.94	10.06	280.9	0.54	108.4	25.4	9.10
47740.0	1989 AUG 1.5	1.01	308.8	0.0	131.3	18.1	5.10	82.8	-0.39	126.4	2.5	5.85	10.06	281.2	0.52	108.8	25.3	9.18
47750.0	1989 AUG 11.5	1.01	318.4	0.0	140.8	15.3	5.11	83.6	-0.37	127.3	2.4	5.75	10.06	281.5	0.51	109.1	25.3	9.27
47760.0	1989 AUG 21.5	1.01	328.0	0.0	150.2	12.2	5.11	84.5	-0.35	128.1	2.4	5.63	10.06	281.8	0.50	109.4	25.2	9.39
47770.0	1989 SEP 0.5	1.01	337.6	0.0	159.3	8.7	5.11	85.3	-0.33	129.0	2.4	5.50	10.06	282.1	0.48	109.8	25.2	9.53
47780.0	1989 SEP 10.5	1.01	347.3	0.0	168.4	5.0	5.12	86.2	-0.31	129.9	2.4	5.36	10.06	282.4	0.47	110.1	25.1	9.68
47790.0	1989 SEP 20.5	1.00	357.1	0.0	177.3	1.1	5.12	87.1	-0.29	130.7	2.3	5.22	10.06	282.7	0.46	110.4	25.1	9.84
47800.0	1989 OCT 0.5	1.00	6.9	0.0	186.3	-2.7	5.12	87.9	-0.27	131.6	2.3	5.06	10.06	283.0	0.45	110.7	25.1	10.00
47810.0	1989 OCT 10.5	1.00	16.8	0.0	195.5	-5.6	5.13	88.8	-0.26	132.4	2.3	4.91	10.06	283.3	0.43	111.1	25.0	10.17
47820.0	1989 OCT 20.5	1.00	26.7	0.0	204.8	-10.3	5.13	89.6	-0.24	133.3	2.2	4.76	10.06	283.6	0.42	111.4	25.0	10.33
47830.0	1989 OCT 30.5	0.99	36.6	0.0	214.3	-13.7	5.13	90.5	-0.22	134.1	2.2	4.62	10.06	283.9	0.41	111.7	24.9	10.48
47840.0	1989 NOV 9.5	0.99	46.7	0.0	224.2	-16.8	5.14	91.3	-0.20	135.0	2.2	4.49	10.06	284.2	0.40	112.0	24.9	10.62
47850.0	1989 NOV 19.5	0.99	56.7	0.0	234.4	-19.4	5.14	92.2	-0.18	135.8	2.1	4.37	10.06	284.5	0.38	112.4	24.8	10.75
47860.0	1989 NOV 29.5	0.99	66.8	0.0	245.0	-21.5	5.14	93.0	-0.16	136.7	2.1	4.28	10.06	284.8	0.37	112.7	24.8	10.85
47870.0	1989 DEC 9.5	0.98	77.0	0.0	255.9	-22.8	5.15	93.9	-0.14	137.5	2.1	4.22	10.06	285.1	0.36	113.0	24.7	10.93
47880.0	1989 DEC 19.5	0.98	87.2	0.0	266.9	-23.4	5.15	94.7	-0.12	138.4	2.0	4.18	10.05	285.4	0.34	113.4	24.6	10.99
47890.0	1989 DEC 29.5	0.98	97.3	0.0	278.0	-23.2	5.16	95.6	-0.10	139.2	2.0	4.17	10.05	285.7	0.33	113.7	24.6	11.03
47900.0	1990 JAN 8.5	0.98	107.5	0.0	289.0	-22.3	5.16	96.4	-0.08	140.1	2.0	4.20	10.05	286.0	0.32	114.0	24.5	11.04
47910.0	1990 JAN 18.5	0.98	117.7	0.0	299.8	-20.5	5.16	97.2	-0.06	140.9	1.9	4.25	10.05	286.3	0.30	114.3	24.5	11.02
47920.0	1990 JAN 28.5	0.98	127.9	0.0	310.3	-18.3	5.17	98.1	-0.04	141.8	1.9	4.34	10.05	286.6	0.29	114.7	24.4	10.97
47930.0	1990 FEB 7.5	0.99	138.0	0.0	320.5	-15.4	5.17	98.9	-0.03	142.6	1.9	4.45	10.05	286.9	0.28	115.0	24.4	10.91
47940.0	1990 FEB 17.5	0.99	148.2	0.0	330.3	-12.1	5.17	99.8	-0.01	143.4	1.8	4.58	10.05	287.2	0.27	115.3	24.3	10.82
47950.0	1990 FEB 27.5	0.99	158.2	0.0	339.9	-8.5	5.18	100.6	0.01	144.3	1.8	4.72	10.05	287.5	0.25	115.6	24.3	10.70
47960.0	1990 MAR 9.5	0.99	168.2	0.0	349.2	-4.4	5.18	101.4	0.03	145.1	1.8	4.88	10.05	287.8	0.24	115.9	24.2	10.57
47970.0	1990 MAR 19.5	1.00	178.2	0.0	358.4	-0.7	5.18	102.3	0.05	145.9	1.7	5.04	10.05	288.1	0.23	116.3	24.1	10.43
47980.0	1990 MAR 29.5	1.00	188.1	0.0	7.5	3.2	5.19	103.1	0.07	146.8	1.7	5.20	10.05	288.4	0.21	116.6	24.1	10.27
47990.0	1990 APR 8.5	1.00	198.0	0.0	16.6	7.1	5.19	104.0	0.09	147.6	1.6	5.36	10.05	288.7	0.20	116.9	24.0	10.11
48000.0	1990 APR 18.5	1.00	207.8	0.0	25.8	10.7	5.20	104.8	0.11	148.4	1.6	5.51	10.04	289.0	0.19	117.2	24.0	9.94
48010.0	1990 APR 28.5	1.01	217.5	0.0	35.2	14.0	5.20	105.6	0.13	149.3	1.6	5.65	10.04	289.3	0.17	117.6	23.9	9.78
48020.0	1990 MAY 8.5	1.01	227.2	0.0	44.8	17.0	5.20	106.4	0.15	150.1	1.5	5.78	10.04	289.6	0.16	117.9	23.8	9.62
48030.0	1990 MAY 18.5	1.01	236.9	0.0	54.6	19.5	5.21	107.3	0.16	150.9	1.5	5.90	10.04	289.9	0.15	118.2	23.8	9.47
48040.0	1990 MAY 28.5	1.01	246.5	0.0	64.6	21.4	5.21	108.1	0.18	151.8	1.5	6.01	10.04	290.2	0.14	118.5	23.7	9.34
48050.0	1990 JUN 7.5	1.01	256.1	0.0	74.9	22.7	5.21	108.9	0.20	152.6	1.4	6.09	10.04	290.5	0.12	118.9	23.6	9.22
48060.0	1990 JUN 17.5	1.02	265.6	0.0	85.2	23.4	5.22	109.8	0.22	153.4	1.4	6.16	10.04	290.8	0.11	119.2	23.6	9.13
48070.0	1990 JUN 27.5	1.02	275.2	0.0	95.5	23.3	5.22	110.6	0.24	154.2	1.3	6.21	10.04	291.1	0.10	119.5	23.5	9.07
48080.0	1990 JUL 7.5	1.02	284.7	0.0	106.0	22.6	5.22	111.4	0.26	155.1	1.3	6.24	10.04	291.4	0.08	119.8	23.4	9.03
48090.0	1990 JUL 17.5	1.02	294.2	0.0	116.1	21.3	5.23	112.2	0.28	155.9	1.3	6.24	10.04	291.7	0.07	120.1	23.4	9.02
48100.0	1990 JUL 27.5	1.02	303.8	0.0	126.1	19.3	5.23	113.0	0.29	156.7	1.2	6.23	10.04	292.0	0.06	120.5	23.3	9.04
48110.0	1990 AUG 6.5	1.01	313.3	0.0	135.8	16.8	5.24	113.9	0.31	157.5	1.2	6.20	10.03	292.3	0.04	120.8	23.2	9.09
48120.0	1990 AUG 16.5	1.01	322.9	0.0	145.3	13.9	5.24	114.7	0.33	158.3	1.1	6.15	10.03	292.6	0.03	121.1	23.2	9.17
48130.0	1990 AUG 26.5	1.01	332.6	0.0	154.6	10.6	5.24	115.5	0.35	159.2	1.1	6.08	10.03	292.9	0.02	121.4	23.1	9.28
48140.0	1990 SEP 5.5	1.01	342.2	0.0	163.6	7.0	5.25	116.3	0.37	160.0	1.1	5.99	10.03	293.2	0.00	121.7	23.0	9.40

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
47300.0	1988 MAY 18.5	19.27	268.3	-0.19	212.7	75.5	18.41	30.21	278.2	0.97	268.1	-28.8	29.45	29.58	221.0	16.08	176.0	0.0	28.65
47310.0	1988 MAY 28.5	19.27	268.4	-0.19	212.4	75.5	18.33	30.21	278.2	0.97	268.2	-28.8	29.35	29.58	221.1	16.07	176.1	0.0	28.71
47320.0	1988 JUN 7.5	19.27	268.5	-0.20	212.2	75.4	18.28	30.21	278.3	0.97	268.3	-28.8	29.27	29.58	221.2	16.06	176.1	0.0	28.79
47330.0	1988 JUN 17.5	19.28	268.6	-0.20	211.9	75.3	18.26	30.21	278.3	0.97	268.3	-28.8	29.22	29.58	221.2	16.05	176.2	0.0	28.90
47340.0	1988 JUN 27.5	19.28	268.7	-0.20	211.7	75.2	18.27	30.21	278.4	0.97	268.4	-28.8	29.19	29.58	221.3	16.05	176.3	0.0	29.02
47350.0	1988 JUL 7.5	19.28	268.9	-0.20	211.4	75.1	18.31	30.21	278.4	0.96	268.5	-28.8	29.20	29.58	221.4	16.04	176.3	0.0	29.16
47360.0	1988 JUL 17.5	19.28	269.0	-0.20	211.2	75.0	18.37	30.21	278.5	0.96	268.5	-28.8	29.23	29.58	221.4	16.03	176.4	0.0	29.32
47370.0	1988 JUL 27.5	19.28	269.1	-0.20	210.9	74.9	18.46	30.21	278.6	0.96	268.6	-28.8	29.30	29.58	221.5	16.02	176.5	0.0	29.47
47380.0	1988 AUG 6.5	19.28	269.2	-0.21	210.7	74.8	18.58	30.21	278.6	0.96	268.7	-28.8	29.38	29.58	221.6	16.02	176.5	0.0	29.64
47390.0	1988 AUG 16.5	19.29	269.3	-0.21	210.5	74.7	18.71	30.21	278.7	0.96	268.7	-28.8	29.50	29.58	221.7	16.01	176.6	0.0	29.80
47400.0	1988 AUG 26.5	19.29	269.4	-0.21	210.2	74.5	18.86	30.21	278.7	0.96	268.8	-28.8	29.63	29.58	221.7	16.00	176.7	0.0	29.95
47410.0	1988 SEP 5.5	19.29	269.6	-0.21	210.0	74.3	19.02	30.21	278.8	0.95	268.9	-28.8	29.78	29.58	221.8	15.99	176.8	0.0	30.09
47420.0	1988 SEP 15.5	19.29	269.7	-0.21	209.8	74.4	19.19	30.21	278.9	0.95	268.9	-28.8	29.94	29.58	221.9	15.99	176.8	0.0	30.22
47430.0	1988 SEP 25.5	19.29	269.8	-0.21	209.6	74.3	19.36	30.21	278.9	0.95	269.0	-28.8	30.11	29.58	221.9	15.98	176.9	0.0	30.33
47440.0	1988 OCT 5.5	19.30	269.9	-0.21	209.4	74.2	19.53	30.21	279.0	0.95	269.1	-28.8	30.28	29.58	222.0	15.97	177.0	0.0	30.42
47450.0	1988 OCT 15.5	19.30	270.0	-0.22	209.2	74.1	19.69	30.20	279.0	0.95	269.1	-28.8	30.44	29.58	222.1	15.96	177.0	0.0	30.48
47460.0	1988 OCT 25.5	19.30	270.1	-0.22	208.9	74.0	19.84	30.20	279.1	0.95	269.2	-28.8	30.60	29.58	222.2	15.96	177.1	0.0	30.52
47470.0	1988 NOV 4.5	19.30	270.3	-0.22	208.7	73.9	19.97	30.20	279.2	0.94	269.3	-28.8	30.75	29.58	222.2	15.95	177.2	0.0	30.53
47480.0	1988 NOV 14.5	19.30	270.4	-0.22	208.5	73.8	20.09	30.20	279.2	0.94	269.3	-28.8	30.88	29.58	222.3	15.94	177.2	0.0	30.52
47490.0	1988 NOV 24.5	19.30	270.5	-0.22	208.3	73.7	20.18	30.20	279.3	0.94	269.4	-28.8	31.00	29.58	222.4	15.93	177.3	0.0	30.47
47500.0	1988 DEC 4.5	19.31	270.6	-0.22	208.1	73.6	20.24	30.20	279.3	0.94	269.5	-28.8	31.08	29.58	222.4	15.93	177.4	0.0	30.40
47510.0	1988 DEC 14.5	19.31	270.7	-0.23	207.9	73.5	20.28	30.20	279.4	0.94	269.6	-28.8	31.15	29.58	222.5	15.92	177.4	0.0	30.31
47520.0	1988 DEC 24.5	19.31	270.8	-0.23	207.7	73.4	20.29	30.20	279.5	0.94	269.6	-28.8	31.18	29.58	222.6	15.91	177.5	0.0	30.19
47530.0	1989 JAN 3.5	19.31	270.9	-0.23	207.5	73.3	20.28	30.20	279.5	0.94	269.7	-28.8	31.18	29.57	222.7	15.90	177.6	0.0	30.06
47540.0	1989 JAN 13.5	19.31	271.1	-0.23	207.3	73.2	20.23	30.20	279.6	0.93	269.8	-28.8	31.16	29.57	222.7	15.89	177.6	0.0	29.91
47550.0	1989 JAN 23.5	19.32	271.2	-0.23	207.2	73.1	20.16	30.20	279.6	0.93	269.8	-28.8	31.11	29.57	222.8	15.89	177.7	0.0	29.75
47560.0	1989 FEB 2.5	19.32	271.3	-0.23	207.0	73.0	20.05	30.20	279.7	0.93	269.9	-28.8	31.03	29.57	222.9	15.88	177.8	0.0	29.58
47570.0	1989 FEB 12.5	19.32	271.4	-0.23	206.8	72.9	19.94	30.20	279.7	0.93	270.0	-28.8	30.92	29.57	222.9	15.87	177.8	0.0	29.42
47580.0	1989 FEB 22.5	19.32	271.5	-0.24	206.6	72.8	19.81	30.20	279.8	0.93	270.0	-28.8	30.80	29.57	223.0	15.86	177.9	0.0	29.26
47590.0	1989 MAR 4.5	19.32	271.6	-0.24	206.4	72.7	19.65	30.20	279.9	0.93	270.1	-28.8	30.66	29.57	223.1	15.86	178.0	0.0	29.10
47600.0	1989 MAR 14.5	19.32	271.8	-0.24	206.2	72.6	19.49	30.20	279.9	0.92	270.2	-28.8	30.50	29.57	223.1	15.85	178.1	0.0	28.96
47610.0	1989 MAR 24.5	19.33	271.9	-0.24	206.1	72.5	19.33	30.20	280.0	0.92	270.2	-28.8	30.33	29.57	223.2	15.84	178.1	0.0	28.84
47620.0	1989 APR 3.5	19.33	272.0	-0.24	205.9	72.4	19.16	30.20	280.0	0.92	270.3	-28.8	30.16	29.57	223.3	15.83	178.2	0.0	28.74
47630.0	1989 APR 13.5	19.33	272.1	-0.24	205.7	72.3	18.99	30.20	280.1	0.92	270.4	-28.8	29.99	29.57	223.4	15.82	178.3	0.0	28.67
47640.0	1989 APR 23.5	19.33	272.2	-0.24	205.5	72.2	18.84	30.20	280.2	0.92	270.4	-28.8	29.83	29.57	223.4	15.82	178.3	0.0	28.62
47650.0	1989 MAY 3.5	19.33	272.3	-0.25	205.4	72.1	18.70	30.20	280.2	0.92	270.5	-28.8	29.67	29.57	223.5	15.81	178.4	0.0	28.60
47660.0	1989 MAY 13.5	19.34	272.5	-0.25	205.2	72.0	18.57	30.20	280.3	0.92	270.6	-28.8	29.53	29.57	223.6	15.80	178.5	0.0	28.61
47670.0	1989 MAY 23.5	19.34	272.6	-0.25	205.0	71.9	18.47	30.20	280.3	0.91	270.6	-28.8	29.41	29.57	223.6	15.79	178.5	0.0	28.65
47680.0	1989 JUN 2.5	19.34	272.7	-0.25	204.9	71.8	18.40	30.20	280.4	0.91	270.7	-28.8	29.32	29.57	223.7	15.78	178.6	0.0	28.71
47690.0	1989 JUN 12.5	19.34	272.8	-0.25	204.7	71.7	18.35	30.20	280.5	0.91	270.8	-28.8	29.24	29.57	223.8	15.77	178.7	0.0	28.80
47700.0	1989 JUN 22.5	19.34	272.9	-0.25	204.6	71.6	18.33	30.20	280.5	0.91	270.8	-28.8	29.20	29.57	223.9	15.77	178.7	0.0	28.91
47710.0	1989 JUL 2.5	19.34	273.0	-0.25	204.4	71.5	18.34	30.20	280.6	0.91	270.9	-28.8	29.18	29.57	223.9	15.76	178.8	0.0	29.04
47720.0	1989 JUL 12.5	19.35	273.1	-0.26	204.3	71.4	18.37	30.20	280.6	0.91	271.0	-28.8	29.20	29.57	224.0	15.75	178.9	0.0	29.18
47730.0	1989 JUL 22.5	19.35	273.3	-0.26	204.1	71.3	18.44	30.20	280.7	0.90	271.0	-28.8	29.24	29.57	224.1	15.74	178.9	0.0	29.34
47740.0	1989 AUG 1.5	19.35	273.4	-0.26	203.9	71.2	18.53	30.20	280.8	0.90	271.1	-28.8	29.31	29.57	224.1	15.73	179.0	0.0	29.50
47750.0	1989 AUG 11.5	19.35	273.5	-0.26	203.8	71.1	18.65	30.20	280.8	0.90	271.2	-28.8	29.40	29.57	224.2	15.72	179.1	0.0	29.66
47760.0	1989 AUG 21.5	19.35	273.6	-0.26	203.6	71.0	18.78	30.20	280.9	0.90	271.2	-28.8	29.52	29.57	224.3	15.72	179.1	0.0	29.82
47770.0	1989 SEP 0.5	19.36	273.7	-0.26	203.5	70.8	18.93	30.20	280.9	0.90	271.3	-28.8	29.66	29.57	224.3	15.71	179.2	0.0	29.97
47780.0	1989 SEP 10.5	19.36	273.8	-0.26	203.4	70.7	19.10	30.20	281.0	0.90	271.4	-28.8	29.81	29.57	224.4	15.70	179.3	0.0	30.11
47790.0	1989 SEP 20.5	19.36	273.9	-0.27	203.2	70.6	19.27	30.20	281.1	0.89	271.4	-28.8	29.97	29.57	224.5	15.69	179.4	0.0	30.23
47800.0	1989 OCT 0.5	19.36	274.1	-0.27	203.1	70.5	19.44	30.20	281.1	0.89	271.5	-28.8	30.14	29.57	224.6	15.68	179.4	0.0	30.34
47810.0	1989 OCT 10.5	19.36	274.2	-0.27	202.9	70.4	19.60	30.20	281.2	0.89	271.6	-28.8	30.31	29.57	224.6	15.67	179.5	0.0	30.42
47820.0	1989 OCT 20.5	19.36	274.3	-0.27	202.8	70.3	19.77	30.20	281.2	0.89	271.6	-28.8	30.48	29.57	224.7	15.67	179.6	0.0	30.48
47830.0	1989 OCT 30.5	19.37	274.4	-0.27	202.6	70.2	19.91	30.20	281.3	0.89	271.7	-28.8	30.63	29.57	224.8	15.66	179.6	0.0	30.52
47840.0	1989 NOV 9.5	19.37	274.5	-0.27	202.5	70.1	20.05	30.20	281.3	0.89	271.8	-28.8	30.78	29.57	224.8	15.65	179.7	0.0	30.52
47850.0	1989 NOV 19.5	19.37	274.6	-0.28	202.4	70.0	20.15	30.20	281.4	0.89	271.9	-28.8	30.91	29.57	224.9	15.64	179.8	0.0	30.50
47860.0	1989 NOV 29.5	19.37	274.8	-0.28	202.2	69.9	20.25	30.20	281.5	0.88	271.9	-28.8	31.01	29.57	225.0	15.63	179.8	0.0	30.45
47870.0	1989 DEC 9.5	19.37	274.9	-0.28	202.1	69.8	20.31	30.20	281.5	0.88	272.0	-28.8	31.09	29.57	225.1	15.62	179.9	0.0	30.38
47880.0	1989 DEC 19.5	19.38	275.0	-0.28	202.0	69.7	20.35	30.20	281.6	0.88	272.1	-28.8	31.15	29.57	225.1	15.61	180.0	0.0	30.28
47890.0	1989 DEC 29.5	19.38	275.1	-0.28	201.8	69.6	20.36	30.20	281.6	0.88	272.1	-28.8	31.18	29.57	225.2	15.61	180.0	0.0	30.16
47900.0	1990 JAN 8.5	19.38	275.2	-0.28	201.7	69.5	20.34	30.19	281.7	0.88	272.2	-28.8	31.17	29.57	225.3	15.60	180.1	0.0	30.02
47910.0	1990 JAN 18.5	19.38	275.3	-0.28	201.6	69.4	20.29	30.19	281.8	0.88	272.3	-28.8	31.14	29.57	225.3	15.59	180.2	0.0	29.87
47920.0	1990 JAN 28.5	19.38	275.4	-0.29	201.5	69.3	20.22	30.19	281.8	0.87	272.3	-28.8	31.08	29.57	225.4	15.58	180.2	0.0	29.71
47930.0	1990 FEB 7.5	19.38	275.6	-0.29	201.3	69.2	20.12	30.19	281.9	0.87	272.4	-28.8	31.00	29.57	225.5	15.57	180.3	0.0	29.54
47940.0	1990 FEB 17.5	19.39	275.7	-0.29	201.2	69.1	20.00	30.19	281.9	0.87	272.5	-28.8	30.89	29.57	225.5	15.56	180.4	0.0	29.38
47950.0	1990 FEB 27.5	19.39	275.8	-0.29	201.1	69.0	19.87	30.19	282.0	0.87	272.5	-28.8	30.76	29.57	225.6	15.55	180.5	0.0	29.22
47960.0	1990 MAR 9.5	19.39	275.9	-0.29	201.0	68.8	19.71	30.19	282.1	0.87	272.6	-28.8	30.61	29.57	225.7	15.54	180.5	0.0	29.07
47970.0	1990 MAR 19.5	19.39	276.0	-0.29	200.8	68.7	19.55	30.19	282.1	0.87	272.7	-28.8	30.45	29.57	225.8	15.54	180.6	0.0	28.93
47980.0	1990 MAR 29.5	19.39	276.1	-0.29	200.7	68.6	19.38	30.19	282.2	0.86	272.7	-28.8	30.28	29.57	225.8	15.53	180.7	0.0	28.82
47990.0	1990 APR 8.5	19.40	276.2	-0.30	200.5	68.5	19.22	30.19	282.2	0.86	272.8	-28.8	30.11	29.57	225.9	15.52	180.7	0.0	28.72
48000.0	1990 APR 18.5	19.40	276.4	-0.30	200.5	68.4	19.05	30.19	282.3	0.86	272.9	-28.8	29.94	29.57	226.0	15.51	180.8	0.0	28.65
48010.0	1990 APR 28.5	19.40	276.5	-0.30	200.4	68.3	18.90	30.19	282.4	0.86	272.9	-28.8	29.78	29.57	226.0	15.50	180.9	0.0	28.61
48020.0	1990 MAY 8.5	19.40	276.6	-0.30	200.3	68.2	18.76	30.19	282.4	0.86	273.0	-28.8	29.63	29.57	226.1	15.49	180.9	0.0	28.60
48030.0	1990 MAY 18.5	19.40	276.7	-0.30	200.1	68.1	18.64	30.19	282.5	0.86	273.1	-28.8	29.49	29.57	226.2	15.48	181.0	0.0	28.61
48040.0	1990 MAY 28.5	19.40	276.8	-0.30	200.0	68.0	18.54	30.19	282.5	0.85	273.1	-28.8	29.38	29.57	226.3	15.47	181.1	0.0	28.66
48050.0	1990 JUN 7.5	19.41	276.9	-0.30	199.9	67.9	18.46	30.19	282.6	0.85	273.2	-28.8	29.29	29.57	226.3	15.46	181.1	0.0	28.73
48060.0	1990 JUN 17.5	19.41	277.0	-0.31	199.8	67.8	18.41	30.19	282.7	0.85	273.3	-28.8	29.22	29.57	226.4	15.46	181.2	0.0	28.82
48070.0	1990 JUN 27.5	19.41	277.2	-0.31	199.7	67.7	18.39	30.19	282.7	0.85	273.3	-28.8	29.18	29.57	226.5	15.45	181.3	0.0	28.93
48080.0	1990 JUL 7.5	19.41	277.3	-0.31	199.6	67.6	18.40	30.19	282.8	0.85	273.4	-28.8	29.17	29.57	226.5	15.44	181.3	0.0	29.07
48090.0	1990 JUL 17.5	19.41	277.4	-0.31	199.5	67.5	18.44	30.19	282.8	0.85	273.5	-28.8	29.20	29.57	226.6	15.43	181.4	0.0	29.21
48100.0	1990 JUL 27.5	19.41	277.5	-0.31	199.4	67.4	18.51	30.19	282.9	0.85	273.5	-28.8	29.24	29.57	226.7	15.42	181.5	0.0	29.37
48110.0	1990 AUG 6.5	19.42	277.6	-0.31	199.3	67.2	18.60	30.19	282.9	0.84	273.6	-28.8	29.32	29.57	226.7	15.41	181.5	0.0	29.53
48120.0	1990 AUG 16.5	19.42	277.7	-0.31	199.2	67.1	18.72	30.19	283.0	0.84	273.7	-28.8	29.42	29.57	226.8	15.40	181.6	0.0	29.69
48130.0	1990 AUG 26.5	19.42	277.8	-0.32	199.1	67.0	18.85	30.19	283.1	0.84	273.7	-28.7	29.54	29.57	226.9	15.39	181.7	0.0	29.85
48140.0	1990 SEP 5.5	19.42	278.0	-0.32	199.0	66.9	19.01	30.19	283.1	0.84	273.8	-28.7	29.68	29.57	227.0	15.38	181.8	0.0	30.00

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
48150.0	1990 SEP 15.5	1.01	352.0	0.0	172.6	3.2	5.25	117.1	0.38	160.8	1.0	5.89	10.03	293.5	-0.01	122.1	23.0	9.54
48160.0	1990 SEP 25.5	1.00	1.7	0.0	181.5	-0.7	5.25	118.0	0.40	161.6	1.0	5.77	10.03	293.8	-0.02	122.4	22.9	9.70
48170.0	1990 OCT 5.5	1.00	11.6	0.0	190.6	-4.5	5.25	118.8	0.42	162.4	0.9	5.63	10.03	294.1	-0.04	122.7	22.8	9.86
48180.0	1990 OCT 15.5	1.00	21.4	0.0	199.8	-8.4	5.26	119.6	0.44	163.2	0.9	5.49	10.03	294.4	-0.05	123.0	22.7	10.02
48190.0	1990 OCT 25.5	0.99	31.4	0.0	209.3	-12.0	5.26	120.4	0.45	164.0	0.8	5.34	10.03	294.7	-0.06	123.3	22.7	10.19
48200.0	1990 NOV 4.5	0.99	41.4	0.0	219.0	-15.3	5.27	121.2	0.47	164.8	0.8	5.18	10.02	295.0	-0.07	123.6	22.6	10.35
48210.0	1990 NOV 14.5	0.99	51.4	0.0	229.0	-18.1	5.27	122.0	0.49	165.7	0.8	5.03	10.02	295.3	-0.09	124.0	22.5	10.50
48220.0	1990 NOV 24.5	0.99	61.5	0.0	239.4	-20.5	5.27	122.8	0.51	166.5	0.7	4.88	10.02	295.6	-0.10	124.3	22.4	10.63
48230.0	1990 DEC 4.5	0.99	71.6	0.0	250.1	-22.2	5.28	123.6	0.52	167.3	0.7	4.73	10.02	295.9	-0.11	124.6	22.4	10.75
48240.0	1990 DEC 14.5	0.98	81.8	0.0	261.1	-23.2	5.28	124.4	0.54	168.1	0.6	4.61	10.02	296.2	-0.13	124.9	22.3	10.85
48250.0	1990 DEC 24.5	0.98	92.0	0.0	272.2	-23.4	5.28	125.2	0.56	168.9	0.6	4.49	10.02	296.5	-0.14	125.2	22.2	10.92
48260.0	1991 JAN 3.5	0.98	102.2	0.0	283.3	-22.9	5.29	126.0	0.57	169.7	0.6	4.41	10.02	296.8	-0.15	125.5	22.1	10.97
48270.0	1991 JAN 13.5	0.98	112.4	0.0	294.2	-21.6	5.29	126.8	0.59	170.5	0.5	4.35	10.02	297.1	-0.17	125.9	22.1	11.00
48280.0	1991 JAN 23.5	0.98	122.6	0.0	304.8	-19.5	5.29	127.6	0.60	171.3	0.5	4.32	10.01	297.4	-0.18	126.2	22.0	10.99
48290.0	1991 FEB 2.5	0.99	132.7	0.0	315.2	-17.0	5.30	128.4	0.62	172.1	0.4	4.32	10.01	297.7	-0.19	126.5	21.9	10.97
48300.0	1991 FEB 12.5	0.99	142.8	0.0	325.2	-13.9	5.30	129.2	0.64	172.9	0.4	4.35	10.01	298.1	-0.21	126.8	21.8	10.92
48310.0	1991 FEB 22.5	0.99	152.9	0.0	334.9	-10.4	5.30	130.0	0.65	173.7	0.3	4.41	10.01	298.4	-0.22	127.1	21.7	10.84
48320.0	1991 MAR 4.5	0.99	163.0	0.0	344.3	-6.7	5.31	130.8	0.67	174.5	0.3	4.50	10.01	298.7	-0.23	127.4	21.6	10.74
48330.0	1991 MAR 14.5	0.99	173.0	0.0	353.6	-2.8	5.31	131.6	0.68	175.3	0.3	4.61	10.01	299.0	-0.25	127.7	21.6	10.62
48340.0	1991 MAR 24.5	1.00	182.9	0.0	2.7	1.2	5.31	132.4	0.70	176.1	0.2	4.74	10.01	299.3	-0.26	128.1	21.5	10.49
48350.0	1991 APR 3.5	1.00	192.8	0.0	11.8	5.1	5.32	133.2	0.71	176.9	0.2	4.89	10.00	299.6	-0.27	128.4	21.4	10.34
48360.0	1991 APR 13.5	1.00	202.6	0.0	20.9	8.3	5.32	134.0	0.73	177.7	0.1	5.04	10.00	299.9	-0.28	128.7	21.3	10.18
48370.0	1991 APR 23.5	1.01	212.4	0.0	30.2	12.3	5.32	134.8	0.74	178.4	0.1	5.20	10.00	300.2	-0.30	129.0	21.2	10.01
48380.0	1991 MAY 3.5	1.01	222.1	0.0	39.7	15.5	5.33	135.6	0.76	179.2	0.0	5.36	10.00	300.5	-0.31	129.3	21.1	9.85
48390.0	1991 MAY 13.5	1.01	231.8	0.0	49.4	18.2	5.33	136.4	0.77	180.0	-0.0	5.52	10.00	300.8	-0.32	129.6	21.1	9.68
48400.0	1991 MAY 23.5	1.01	241.4	0.0	59.3	20.5	5.33	137.2	0.79	180.8	-0.0	5.67	10.00	301.1	-0.34	129.9	21.0	9.53
48410.0	1991 JUN 2.5	1.01	251.0	0.0	69.5	22.1	5.34	138.0	0.80	181.6	-0.1	5.81	10.00	301.4	-0.35	130.2	20.9	9.38
48420.0	1991 JUN 12.5	1.02	260.6	0.0	79.8	23.1	5.34	138.8	0.82	182.4	-0.1	5.94	9.99	301.7	-0.36	130.6	20.8	9.25
48430.0	1991 JUN 22.5	1.02	270.1	0.0	90.2	23.4	5.34	139.6	0.83	183.2	-0.2	6.05	9.99	302.0	-0.38	130.9	20.7	9.14
48440.0	1991 JUL 2.5	1.02	279.7	0.0	100.6	23.1	5.35	140.3	0.84	184.0	-0.2	6.15	9.99	302.3	-0.39	131.2	20.6	9.06
48450.0	1991 JUL 12.5	1.02	289.2	0.0	110.8	22.1	5.35	141.1	0.86	184.7	-0.3	6.23	9.99	302.6	-0.40	131.5	20.5	9.00
48460.0	1991 JUL 22.5	1.02	298.8	0.0	120.9	20.4	5.35	141.9	0.87	185.5	-0.3	6.30	9.99	302.9	-0.42	131.8	20.4	8.97
48470.0	1991 AUG 1.5	1.01	308.3	0.0	130.8	18.2	5.35	142.7	0.88	186.3	-0.3	6.34	9.99	303.2	-0.43	132.1	20.3	8.98
48480.0	1991 AUG 11.5	1.01	317.9	0.0	140.3	15.5	5.36	143.5	0.90	187.1	-0.4	6.37	9.98	303.5	-0.44	132.4	20.3	9.01
48490.0	1991 AUG 21.5	1.01	327.5	0.0	149.7	12.3	5.36	144.3	0.91	187.9	-0.4	6.37	9.98	303.8	-0.45	132.7	20.2	9.07
48500.0	1991 SEP 0.5	1.01	337.1	0.0	158.9	8.9	5.36	145.0	0.92	188.7	-0.5	6.35	9.98	304.1	-0.47	133.0	20.1	9.15
48510.0	1991 SEP 10.5	1.01	346.8	0.0	167.9	5.2	5.36	145.8	0.94	189.4	-0.5	6.32	9.98	304.4	-0.48	133.4	20.0	9.26
48520.0	1991 SEP 20.5	1.00	356.6	0.0	176.9	1.3	5.37	146.6	0.95	190.2	-0.5	6.26	9.98	304.7	-0.49	133.7	19.9	9.39
48530.0	1991 OCT 0.5	1.00	6.4	0.0	185.9	-2.5	5.37	147.4	0.96	191.0	-0.6	6.18	9.98	305.0	-0.51	134.0	19.8	9.54
48540.0	1991 OCT 10.5	1.00	16.2	0.0	195.0	-6.4	5.37	148.2	0.97	191.8	-0.6	6.09	9.97	305.4	-0.52	134.3	19.7	9.69
48550.0	1991 OCT 20.5	1.00	26.2	0.0	204.3	-10.1	5.38	148.9	0.98	192.5	-0.7	5.97	9.97	305.7	-0.53	134.6	19.6	9.86
48560.0	1991 OCT 30.5	0.99	36.1	0.0	213.8	-13.5	5.38	149.7	1.00	193.3	-0.7	5.85	9.97	306.0	-0.55	134.9	19.5	10.02
48570.0	1991 NOV 9.5	0.99	46.1	0.0	223.7	-15.7	5.38	150.5	1.01	194.1	-0.7	5.71	9.97	306.3	-0.56	135.2	19.4	10.19
48580.0	1991 NOV 19.5	0.99	56.2	0.0	233.9	-19.3	5.38	151.3	1.02	194.9	-0.8	5.56	9.97	306.6	-0.57	135.5	19.3	10.34
48590.0	1991 NOV 29.5	0.99	66.3	0.0	244.5	-21.4	5.39	152.0	1.03	195.6	-0.8	5.40	9.97	306.9	-0.58	135.8	19.2	10.49
48600.0	1991 DEC 9.5	0.98	76.5	0.0	255.3	-22.8	5.39	152.8	1.04	196.4	-0.9	5.24	9.96	307.2	-0.60	136.1	19.1	10.62
48610.0	1991 DEC 19.5	0.98	86.6	0.0	266.4	-23.4	5.39	153.6	1.05	197.2	-0.9	5.09	9.96	307.5	-0.61	136.4	19.0	10.73
48620.0	1991 DEC 29.5	0.98	96.8	0.0	277.5	-23.3	5.39	154.4	1.06	198.0	-0.9	4.94	9.96	307.8	-0.62	136.7	18.9	10.82
48630.0	1992 JAN 8.5	0.98	107.0	0.0	288.5	-22.4	5.39	155.1	1.07	198.7	-1.0	4.79	9.96	308.1	-0.64	137.0	18.8	10.88
48640.0	1992 JAN 18.5	0.98	117.2	0.0	299.3	-20.7	5.40	155.9	1.08	199.5	-1.0	4.67	9.96	308.4	-0.65	137.3	18.7	10.92
48650.0	1992 JAN 28.5	0.98	127.4	0.0	309.8	-18.4	5.40	156.7	1.09	200.3	-1.1	4.57	9.96	308.7	-0.66	137.7	18.6	10.94
48660.0	1992 FEB 7.5	0.99	137.5	0.0	320.0	-15.5	5.40	157.4	1.10	201.0	-1.1	4.49	9.95	309.0	-0.67	138.0	18.5	10.93
48670.0	1992 FEB 17.5	0.99	147.6	0.0	329.8	-12.3	5.40	158.2	1.11	201.8	-1.1	4.44	9.95	309.3	-0.69	138.3	18.4	10.89
48680.0	1992 FEB 27.5	0.99	157.7	0.0	339.4	-8.7	5.41	159.0	1.12	202.6	-1.2	4.42	9.95	309.6	-0.70	138.6	18.3	10.83
48690.0	1992 MAR 8.5	0.99	167.7	0.0	348.7	-4.8	5.41	159.8	1.13	203.4	-1.2	4.43	9.95	309.9	-0.71	138.9	18.2	10.75
48700.0	1992 MAR 18.5	1.00	177.7	0.0	357.9	-0.9	5.41	160.5	1.14	204.1	-1.3	4.47	9.95	310.2	-0.73	139.2	18.1	10.64
48710.0	1992 MAR 28.5	1.00	187.6	0.0	7.0	3.0	5.41	161.3	1.14	204.9	-1.3	4.54	9.94	310.6	-0.74	139.5	18.0	10.52
48720.0	1992 APR 7.5	1.00	197.5	0.0	16.1	5.9	5.41	162.1	1.15	205.7	-1.3	4.63	9.94	310.9	-0.75	139.8	17.9	10.38
48730.0	1992 APR 17.5	1.00	207.3	0.0	25.3	10.5	5.42	162.8	1.16	206.4	-1.4	4.75	9.94	311.2	-0.76	140.1	17.8	10.23
48740.0	1992 APR 27.5	1.01	217.0	0.0	34.7	13.9	5.42	163.6	1.17	207.2	-1.4	4.89	9.94	311.5	-0.78	140.4	17.7	10.07
48750.0	1992 MAY 7.5	1.01	226.7	0.0	44.3	16.8	5.42	164.4	1.18	207.9	-1.4	5.03	9.94	311.8	-0.79	140.7	17.6	9.90
48760.0	1992 MAY 17.5	1.01	236.4	0.0	54.1	19.4	5.42	165.1	1.18	208.7	-1.5	5.19	9.93	312.1	-0.80	141.0	17.5	9.73
48770.0	1992 MAY 27.5	1.01	246.0	0.0	64.1	21.3	5.42	165.9	1.19	209.5	-1.5	5.34	9.93	312.4	-0.81	141.3	17.4	9.57
48780.0	1992 JUN 6.5	1.01	255.6	0.0	74.4	22.7	5.42	166.6	1.20	210.2	-1.5	5.50	9.93	312.7	-0.83	141.6	17.2	9.42
48790.0	1992 JUN 16.5	1.02	265.1	0.0	84.7	23.4	5.43	167.4	1.20	211.0	-1.6	5.65	9.93	313.0	-0.84	141.9	17.1	9.28
48800.0	1992 JUN 26.5	1.02	274.7	0.0	95.1	23.4	5.43	168.2	1.21	211.8	-1.6	5.80	9.93	313.3	-0.85	142.2	17.0	9.15
48810.0	1992 JUL 6.5	1.02	284.2	0.0	105.4	22.7	5.43	168.9	1.22	212.5	-1.7	5.93	9.92	313.6	-0.87	142.5	16.9	9.05
48820.0	1992 JUL 16.5	1.02	293.7	0.0	115.6	21.4	5.43	169.7	1.22	213.3	-1.7	6.06	9.92	313.9	-0.88	142.8	15.8	8.97
48830.0	1992 JUL 26.5	1.02	303.3	0.0	125.6	19.4	5.43	170.5	1.23	214.0	-1.7	6.17	9.92	314.3	-0.89	143.1	16.7	8.92
48840.0	1992 AUG 5.5	1.01	312.9	0.0	135.3	17.0	5.43	171.2	1.24	214.8	-1.8	6.26	9.92	314.6	-0.90	143.4	16.6	8.90
48850.0	1992 AUG 15.5	1.01	322.4	0.0	144.8	14.0	5.44	172.0	1.24	215.6	-1.8	6.34	9.92	314.9	-0.92	143.7	16.5	8.91
48860.0	1992 AUG 25.5	1.01	332.1	0.0	154.1	10.7	5.44	172.7	1.25	216.3	-1.8	6.39	9.91	315.2	-0.93	144.0	16.4	8.95
48870.0	1992 SEP 4.5	1.01	341.7	0.0	163.2	7.2	5.44	173.5	1.25	217.1	-1.9	6.43	9.91	315.5	-0.94	144.3	16.3	9.02
48880.0	1992 SEP 14.5	1.01	351.5	0.0	172.2	3.4	5.44	174.3	1.26	217.8	-1.9	6.44	9.91	315.8	-0.95	144.6	16.1	9.11
48890.0	1992 SEP 24.5	1.00	1.2	0.0	181.1	-0.5	5.44	175.0	1.26	218.6	-1.9	6.44	9.91	316.1	-0.97	144.9	16.0	9.23
48900.0	1992 OCT 4.5	1.00	11.1	0.0	190.2	-4.4	5.44	175.8	1.27	219.4	-1.9	6.41	9.90	316.4	-0.98	145.2	15.9	9.36
48910.0	1992 OCT 14.5	1.00	20.9	0.0	199.4	-8.2	5.44	176.5	1.27	220.1	-2.0	6.36	9.90	316.7	-0.99	145.5	15.8	9.51
48920.0	1992 OCT 24.5	0.99	30.9	0.0	208.8	-11.8	5.44	177.3	1.27	220.9	-2.0	6.30	9.90	317.0	-1.00	145.8	15.7	9.67
48930.0	1992 NOV 3.5	0.99	40.9	0.0	218.5	-15.1	5.44	178.1	1.28	221.6	-2.0	6.21	9.90	317.3	-1.01	146.1	15.6	9.84
48940.0	1992 NOV 13.5	0.99	50.9	0.0	228.5	-18.3	5.45	178.8	1.28	222.4	-2.1	6.10	9.90	317.7	-1.03	146.4	15.5	10.00
48950.0	1992 NOV 23.5	0.99	61.0	0.0	238.9	-20.4	5.45	179.6	1.28	223.2	-2.1	5.98	9.89	318.0	-1.04	146.7	15.3	10.16
48960.0	1992 DEC 3.5	0.99	71.1	0.0	249.5	-22.1	5.45	180.3	1.29	223.9	-2.1	5.85	9.89	318.3	-1.05	147.0	15.2	10.31
48970.0	1992 DEC 13.5	0.98	81.3	0.0	260.5	-23.2	5.45	181.1	1.29	224.7	-2.2	5.70	9.89	318.6	-1.06	147.3	15.1	10.45
48980.0	1992 DEC 23.5	0.98	91.5	0.0	271.4	-23.4	5.45	181.8	1.29	225.4	-2.2	5.54	9.89	318.9	-1.08	147.6	15.0	10.58
48990.0	1993 JAN 2.5	0.98	101.7	0.0	282.7	-22.9	5.45	182.6	1.29	226.2	-2.2	5.38	9.88	319.2	-1.09	147.9	14.9	10.68

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	COIST	NEPTUNE R	LONG	LAT	RAS	DECS	COIST	PLUTO R	LONG	LAT	RAS	DECS	COIST
48150.0	1990 SEP 15.5	19.42	278.1	-0.32	198.9	55.8	19.17	30.19	283.2	0.84	273.9	-28.7	29.84	29.57	227.0	15.37	181.8	0.0	30.14
48160.0	1990 SEP 25.5	19.43	278.2	-0.32	198.8	66.7	19.34	30.19	283.2	0.84	273.9	-28.7	30.00	29.57	227.1	15.36	181.9	0.0	30.26
48170.0	1990 OCT 5.5	19.43	278.3	-0.32	198.7	66.6	19.51	30.19	283.3	0.83	274.0	-28.7	30.17	29.57	227.2	15.35	182.0	0.0	30.36
48180.0	1990 OCT 15.5	19.43	278.4	-0.32	198.6	66.5	19.68	30.19	283.4	0.83	274.1	-28.7	30.34	29.57	227.2	15.35	182.0	0.0	30.44
48190.0	1990 OCT 25.5	19.43	278.5	-0.32	198.5	66.4	19.84	30.19	283.4	0.83	274.1	-28.7	30.51	29.57	227.3	15.34	182.1	0.0	30.50
48200.0	1990 NOV 4.5	19.43	278.6	-0.32	198.4	66.3	19.99	30.19	283.5	0.83	274.2	-28.7	30.66	29.57	227.4	15.33	182.2	0.0	30.53
48210.0	1990 NOV 14.5	19.43	278.8	-0.33	198.3	66.2	20.12	30.19	283.5	0.83	274.3	-28.7	30.81	29.57	227.5	15.32	182.2	0.0	30.53
48220.0	1990 NOV 24.5	19.44	278.9	-0.33	198.2	66.1	20.23	30.19	283.6	0.83	274.4	-28.7	30.93	29.57	227.5	15.31	182.3	0.0	30.50
48230.0	1990 DEC 4.5	19.44	279.0	-0.33	198.1	66.0	20.32	30.19	283.7	0.82	274.4	-28.7	31.03	29.57	227.6	15.30	182.4	0.0	30.45
48240.0	1990 DEC 14.5	19.44	279.1	-0.33	198.0	65.9	20.38	30.19	283.7	0.82	274.5	-28.7	31.10	29.58	227.7	15.29	182.4	0.0	30.37
48250.0	1990 DEC 24.5	19.44	279.2	-0.33	197.9	65.7	20.42	30.19	283.8	0.82	274.6	-28.7	31.15	29.58	227.7	15.28	182.5	0.0	30.26
48260.0	1991 JAN 3.5	19.44	279.3	-0.33	197.8	65.6	20.42	30.19	283.8	0.82	274.6	-28.7	31.17	29.58	227.8	15.27	182.6	0.0	30.14
48270.0	1991 JAN 13.5	19.44	279.4	-0.33	197.7	65.5	20.40	30.19	283.9	0.82	274.7	-28.7	31.16	29.58	227.9	15.26	182.6	0.0	30.00
48280.0	1991 JAN 23.5	19.45	279.6	-0.34	197.6	65.4	20.36	30.19	284.0	0.82	274.8	-28.7	31.12	29.58	227.9	15.25	182.7	0.0	29.84
48290.0	1991 FEB 2.5	19.45	279.7	-0.34	197.5	65.3	20.28	30.19	284.0	0.81	274.8	-28.7	31.05	29.58	228.0	15.24	182.8	0.0	29.68
48300.0	1991 FEB 12.5	19.45	279.8	-0.34	197.4	65.2	20.18	30.19	284.1	0.81	274.9	-28.7	30.96	29.58	228.1	15.23	182.9	0.0	29.51
48310.0	1991 FEB 22.5	19.45	279.9	-0.34	197.4	65.1	20.05	30.19	284.1	0.81	275.0	-28.7	30.85	29.58	228.2	15.22	182.9	0.0	29.35
48320.0	1991 MAR 4.5	19.45	280.0	-0.34	197.3	65.0	19.92	30.19	284.2	0.81	275.0	-28.7	30.71	29.58	228.2	15.21	183.0	0.0	29.19
48330.0	1991 MAR 14.5	19.46	280.1	-0.34	197.2	64.9	19.77	30.18	284.3	0.81	275.1	-28.7	30.56	29.58	228.3	15.20	183.1	0.0	29.04
48340.0	1991 MAR 24.5	19.46	280.2	-0.34	197.1	64.8	19.61	30.18	284.3	0.81	275.2	-28.7	30.40	29.58	228.4	15.19	183.1	0.0	28.91
48350.0	1991 APR 3.5	19.46	280.4	-0.35	197.0	64.7	19.44	30.18	284.4	0.80	275.2	-28.7	30.23	29.58	228.4	15.18	183.2	0.0	28.80
48360.0	1991 APR 13.5	19.46	280.5	-0.35	196.9	64.6	19.27	30.18	284.4	0.80	275.3	-28.7	30.06	29.58	228.5	15.17	183.3	0.0	28.71
48370.0	1991 APR 23.5	19.46	280.6	-0.35	196.8	64.5	19.11	30.18	284.5	0.80	275.4	-28.7	29.89	29.58	228.6	15.17	183.3	0.0	28.65
48380.0	1991 MAY 3.5	19.46	280.7	-0.35	196.8	64.3	18.96	30.18	284.5	0.80	275.4	-28.7	29.73	29.58	228.6	15.16	183.4	0.0	28.61
48390.0	1991 MAY 13.5	19.47	280.8	-0.35	196.7	64.2	18.82	30.18	284.6	0.80	275.5	-28.7	29.58	29.58	228.7	15.15	183.5	0.0	28.61
48400.0	1991 MAY 23.5	19.47	280.9	-0.35	196.6	64.1	18.70	30.18	284.7	0.80	275.6	-28.7	29.45	29.58	228.8	15.14	183.5	0.0	28.63
48410.0	1991 JUN 2.5	19.47	281.0	-0.35	196.5	64.0	18.60	30.18	284.7	0.79	275.6	-28.7	29.34	29.58	228.9	15.13	183.6	0.0	28.68
48420.0	1991 JUN 12.5	19.47	281.2	-0.36	196.4	63.9	18.52	30.18	284.8	0.79	275.7	-28.7	29.26	29.58	228.9	15.12	183.7	0.0	28.75
48430.0	1991 JUN 22.5	19.47	281.3	-0.36	196.3	63.8	18.48	30.18	284.8	0.79	275.8	-28.7	29.20	29.58	229.0	15.11	183.7	0.0	28.85
48440.0	1991 JUL 2.5	19.47	281.4	-0.36	196.3	63.7	18.46	30.18	284.9	0.79	275.8	-28.7	29.17	29.58	229.1	15.10	183.8	0.0	28.97
48450.0	1991 JUL 12.5	19.48	281.5	-0.36	196.2	63.6	18.47	30.18	285.0	0.79	275.9	-28.7	29.17	29.58	229.1	15.09	183.9	0.0	29.11
48460.0	1991 JUL 22.5	19.48	281.6	-0.36	196.1	63.5	18.51	30.18	285.0	0.79	276.0	-28.7	29.20	29.58	229.2	15.08	183.9	0.0	29.26
48470.0	1991 AUG 1.5	19.48	281.7	-0.36	196.0	63.4	18.58	30.18	285.1	0.78	276.0	-28.7	29.25	29.58	229.3	15.07	184.0	0.0	29.41
48480.0	1991 AUG 11.5	19.48	281.8	-0.36	196.0	63.3	18.67	30.18	285.1	0.78	276.1	-28.7	29.33	29.58	229.3	15.06	184.1	0.0	29.58
48490.0	1991 AUG 21.5	19.48	281.9	-0.36	195.9	63.2	18.79	30.18	285.2	0.78	276.2	-28.7	29.44	29.59	229.4	15.05	184.2	0.0	29.74
48500.0	1991 SEP 0.5	19.48	282.1	-0.37	195.8	63.0	18.92	30.18	285.3	0.78	276.2	-28.7	29.57	29.59	229.5	15.04	184.2	0.0	29.90
48510.0	1991 SEP 10.5	19.49	282.2	-0.37	195.7	62.9	19.08	30.18	285.3	0.78	276.3	-28.7	29.71	29.59	229.6	15.03	184.3	0.0	30.05
48520.0	1991 SEP 20.5	19.49	282.3	-0.37	195.7	62.8	19.24	30.18	285.4	0.78	276.4	-28.7	29.87	29.59	229.6	15.02	184.4	0.0	30.18
48530.0	1991 OCT 0.5	19.49	282.4	-0.37	195.6	62.7	19.41	30.18	285.4	0.77	276.4	-28.6	30.04	29.59	229.7	15.01	184.4	0.0	30.30
48540.0	1991 OCT 10.5	19.49	282.5	-0.37	195.5	62.6	19.58	30.18	285.5	0.77	276.5	-28.6	30.21	29.59	229.8	15.00	184.5	0.0	30.40
48550.0	1991 OCT 20.5	19.49	282.6	-0.37	195.4	62.5	19.75	30.18	285.6	0.77	276.6	-28.6	30.38	29.59	229.8	14.99	184.6	0.0	30.47
48560.0	1991 OCT 30.5	19.49	282.7	-0.37	195.4	62.4	19.91	30.18	285.6	0.77	276.6	-28.6	30.54	29.59	229.9	14.98	184.5	0.0	30.52
48570.0	1991 NOV 9.5	19.50	282.9	-0.38	195.3	62.3	20.06	30.18	285.7	0.77	276.7	-28.6	30.69	29.59	230.0	14.97	184.7	0.0	30.55
48580.0	1991 NOV 19.5	19.50	283.0	-0.38	195.2	62.2	20.19	30.18	285.7	0.77	276.8	-28.6	30.83	29.59	230.0	14.96	184.8	0.0	30.54
48590.0	1991 NOV 29.5	19.50	283.1	-0.38	195.1	62.1	20.30	30.18	285.8	0.77	276.9	-28.6	30.95	29.59	230.1	14.95	184.8	0.0	30.51
48600.0	1991 DEC 9.5	19.50	283.2	-0.38	195.1	62.0	20.39	30.18	285.9	0.76	276.9	-28.6	31.04	29.59	230.2	14.94	184.9	0.0	30.45
48610.0	1991 DEC 19.5	19.50	283.3	-0.38	195.0	61.9	20.45	30.18	285.9	0.76	277.0	-28.6	31.11	29.59	230.3	14.93	185.0	0.0	30.36
48620.0	1991 DEC 29.5	19.51	283.4	-0.38	194.9	61.7	20.48	30.18	286.0	0.76	277.1	-28.6	31.15	29.59	230.3	14.92	185.0	0.0	30.26
48630.0	1992 JAN 8.5	19.51	283.5	-0.38	194.9	61.6	20.49	30.18	286.0	0.76	277.1	-28.6	31.16	29.59	230.4	14.91	185.1	0.0	30.13
48640.0	1992 JAN 18.5	19.51	283.7	-0.38	194.8	61.5	20.47	30.18	286.1	0.76	277.2	-28.6	31.14	29.59	230.5	14.90	185.2	0.0	29.98
48650.0	1992 JAN 28.5	19.51	283.8	-0.39	194.7	61.4	20.42	30.18	286.2	0.76	277.3	-28.6	31.10	29.59	230.5	14.88	185.2	0.0	29.83
48660.0	1992 FEB 7.5	19.51	283.9	-0.39	194.7	61.3	20.34	30.18	286.2	0.75	277.3	-28.6	31.02	29.60	230.6	14.87	185.3	0.0	29.66
48670.0	1992 FEB 17.5	19.51	284.0	-0.39	194.6	61.2	20.24	30.18	286.3	0.75	277.4	-28.6	30.93	29.60	230.7	14.86	185.4	0.0	29.50
48680.0	1992 FEB 27.5	19.52	284.1	-0.39	194.5	61.1	20.12	30.18	286.3	0.75	277.5	-28.6	30.80	29.60	230.7	14.85	185.5	0.0	29.33
48690.0	1992 MAR 8.5	19.52	284.2	-0.39	194.5	61.0	19.98	30.18	286.4	0.75	277.5	-28.6	30.67	29.60	230.8	14.84	185.5	0.0	29.18
48700.0	1992 MAR 18.5	19.52	284.3	-0.39	194.4	60.9	19.83	30.18	286.4	0.75	277.6	-28.6	30.51	29.60	230.9	14.83	185.6	0.0	29.03
48710.0	1992 MAR 28.5	19.52	284.4	-0.39	194.3	60.8	19.65	30.18	286.5	0.75	277.7	-28.6	30.35	29.60	231.0	14.82	185.7	0.0	28.91
48720.0	1992 APR 7.5	19.52	284.6	-0.40	194.3	60.7	19.50	30.18	286.6	0.74	277.7	-28.6	30.18	29.60	231.0	14.81	185.7	0.0	28.80
48730.0	1992 APR 17.5	19.52	284.7	-0.40	194.2	60.6	19.33	30.18	286.6	0.74	277.8	-28.6	30.01	29.60	231.1	14.80	185.8	0.0	28.72
48740.0	1992 APR 27.5	19.53	284.8	-0.40	194.1	60.4	19.17	30.18	286.7	0.74	277.9	-28.6	29.84	29.60	231.2	14.79	185.9	0.0	28.66
48750.0	1992 MAY 7.5	19.53	284.9	-0.40	194.1	60.3	19.01	30.18	286.7	0.74	277.9	-28.6	29.68	29.60	231.2	14.78	185.9	0.0	28.63
48760.0	1992 MAY 17.5	19.53	285.0	-0.40	194.0	60.2	18.88	30.17	286.8	0.74	278.0	-28.6	29.54	29.60	231.3	14.77	186.0	0.0	28.63
48770.0	1992 MAY 27.5	19.53	285.1	-0.40	193.9	60.1	18.76	30.17	286.9	0.74	278.1	-28.6	29.42	29.60	231.4	14.76	186.1	0.0	28.66
48780.0	1992 JUN 6.5	19.53	285.2	-0.40	193.9	60.0	18.66	30.17	286.9	0.73	278.1	-28.6	29.31	29.60	231.4	14.75	186.1	0.0	28.71
48790.0	1992 JUN 16.5	19.53	285.3	-0.40	193.8	59.9	18.58	30.17	287.0	0.73	278.2	-28.6	29.23	29.60	231.5	14.74	186.2	0.0	28.79
48800.0	1992 JUN 26.5	19.54	285.5	-0.41	193.8	59.8	18.54	30.17	287.0	0.73	278.3	-28.5	29.18	29.61	231.6	14.73	186.3	0.0	28.90
48810.0	1992 JUL 6.5	19.54	285.6	-0.41	193.7	59.7	18.52	30.17	287.1	0.73	278.3	-28.5	29.16	29.61	231.7	14.72	186.3	0.0	29.02
48820.0	1992 JUL 16.5	19.54	285.7	-0.41	193.6	59.6	18.53	30.17	287.2	0.73	278.4	-28.5	29.16	29.61	231.7	14.71	186.4	0.0	29.16
48830.0	1992 JUL 26.5	19.54	285.8	-0.41	193.6	59.5	18.57	30.17	287.2	0.73	278.5	-28.5	29.20	29.61	231.8	14.70	186.5	0.0	29.31
48840.0	1992 AUG 5.5	19.54	285.9	-0.41	193.5	59.4	18.64	30.17	287.3	0.72	278.5	-28.5	29.26	29.61	231.9	14.69	186.5	0.0	29.47
48850.0	1992 AUG 15.5	19.54	286.0	-0.41	193.5	59.3	18.74	30.17	287.3	0.72	278.6	-28.5	29.35	29.61	231.9	14.67	186.6	0.0	29.64
48860.0	1992 AUG 25.5	19.55	286.1	-0.41	193.4	59.1	18.86	30.17	287.4	0.72	278.7	-28.5	29.46	29.61	232.0	14.66	186.7	0.0	29.80
48870.0	1992 SEP 4.5	19.55	286.3	-0.41	193.3	59.0	18.99	30.17	287.5	0.72	278.7	-28.5	29.60	29.61	232.1	14.65	186.8	0.0	29.95
48880.0	1992 SEP 14.5	19.55	286.4	-0.42	193.3	58.9	19.15	30.17	287.5	0.72	278.8	-28.5	29.74	29.61	232.1	14.64	186.8	0.0	30.10
48890.0	1992 SEP 24.5	19.55	286.5	-0.42	193.2	58.8	19.31	30.17	287.6	0.71	278.9	-28.5	29.91	29.61	232.2	14.63	186.9	0.0	30.23
48900.0	1992 OCT 4.5	19.55	286.6	-0.42	193.2	58.7	19.48	30.17	287.6	0.71	278.9	-28.5	30.07	29.61	232.3	14.62	187.0	0.0	30.35
48910.0	1992 OCT 14.5	19.55	286.7	-0.42	193.1	58.6	19.65	30.17	287.7	0.71	279.0	-28.5	30.24	29.61	232.4	14.61	187.0	0.0	30.44
48920.0	1992 OCT 24.5	19.56	286.8	-0.42	193.1	58.5	19.82	30.17	287.8	0.71	279.1	-28.5	30.41	29.62	232.4	14.60	187.1	0.0	30.51
48930.0	1992 NOV 3.5	19.56	286.9	-0.42	193.0	58.4	19.98	30.17	287.8	0.71	279.1	-28.5	30.57	29.62	232.5	14.59	187.2	0.0	30.56
48940.0	1992 NOV 13.5	19.56	287.0	-0.42	192.9	58.3	20.13	30.17	287.9	0.71	279.2	-28.5	30.72	29.62	232.6	14.58	187.2	0.0	30.57
48950.0	1992 NOV 23.5	19.56	287.2	-0.43	192.9	58.2	20.26	30.17	287.9	0.70	279.3	-28.5	30.85	29.62	232.6	14.57	187.3	0.0	30.56
48960.0	1992 DEC 3.5	19.56	287.3	-0.43	192.8	58.1	20.37	30.17	288.0	0.70	279.3	-28.5	30.96	29.62	232.7	14.56	187.4	0.0	30.53
48970.0	1992 DEC 13.5	19.56	287.4	-0.43	192.8	57.9	20.45	30.17	288.0	0.70	279.4	-28.5	31.05	29.62	232.8	14.54	187.4	0.0	30.46
48980.0	1992 DEC 23.5	19.57	287.5	-0.43	192.7	57.8	20.51	30.17	288.1	0.70	279.5	-28.5	31.11	29.62	232.8	14.53	187.5	0.0	30.37
48990.0	1993 JAN 2.5	19.57	287.6	-0.43	192.7	57.7	20.55	30.17	288.2	0.70	279.5	-28.5	31.15	29.62	232.9	14.52	187.6	0.0	30.26

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
49000.0	1993 JAN 12.5	0.98	111.9	0.0	293.6	-21.7	5.45	183.4	1.30	226.9	-2.2	5.22	9.88	319.5	-1.10	148.2	14.8	10.76
49010.0	1993 JAN 22.5	0.98	122.0	0.0	304.3	-19.7	5.45	184.1	1.30	227.7	-2.3	5.07	9.88	319.8	-1.11	148.5	14.6	10.82
49020.0	1993 FEB 1.5	0.99	132.2	0.0	314.7	-17.1	5.45	184.9	1.30	228.5	-2.3	4.92	9.88	320.1	-1.12	148.8	14.5	10.85
49030.0	1993 FEB 11.5	0.99	142.3	0.0	324.7	-14.1	5.45	185.6	1.30	229.2	-2.3	4.78	9.88	320.5	-1.14	149.1	14.4	10.86
49040.0	1993 FEB 21.5	0.99	152.4	0.0	334.4	-10.6	5.45	186.4	1.30	230.0	-2.3	4.67	9.87	320.8	-1.15	149.4	14.3	10.84
49050.0	1993 MAR 3.5	0.99	162.5	0.0	343.9	-6.9	5.45	187.1	1.30	230.7	-2.4	4.57	9.87	321.1	-1.16	149.7	14.2	10.80
49060.0	1993 MAR 13.5	0.99	172.5	0.0	353.1	-3.0	5.45	187.9	1.30	231.5	-2.4	4.50	9.87	321.4	-1.17	150.0	14.0	10.73
49070.0	1993 MAR 23.5	1.00	182.4	0.0	2.2	1.0	5.45	188.6	1.30	232.2	-2.4	4.46	9.87	321.7	-1.18	150.3	13.9	10.64
49080.0	1993 APR 2.5	1.00	192.3	0.0	11.3	4.9	5.45	189.4	1.31	233.0	-2.4	4.46	9.86	322.0	-1.20	150.6	13.8	10.53
49090.0	1993 APR 12.5	1.00	202.1	0.0	20.5	8.6	5.45	190.2	1.31	233.7	-2.5	4.48	9.86	322.3	-1.21	150.9	13.7	10.40
49100.0	1993 APR 22.5	1.01	211.9	0.0	29.8	12.1	5.45	190.9	1.31	234.5	-2.5	4.53	9.86	322.6	-1.22	151.2	13.5	10.26
49110.0	1993 MAY 2.5	1.01	221.6	0.0	39.2	15.3	5.45	191.7	1.30	235.3	-2.5	4.61	9.86	322.9	-1.23	151.5	13.4	10.10
49120.0	1993 MAY 12.5	1.01	231.3	0.0	48.9	18.1	5.45	192.4	1.30	236.0	-2.5	4.71	9.85	323.3	-1.24	151.8	13.3	9.94
49130.0	1993 MAY 22.5	1.01	240.9	0.0	58.8	20.4	5.45	193.2	1.30	236.8	-2.6	4.83	9.85	323.6	-1.26	152.1	13.2	9.77
49140.0	1993 JUN 1.5	1.01	250.5	0.0	69.0	22.0	5.45	193.9	1.30	237.5	-2.6	4.97	9.85	323.9	-1.27	152.4	13.1	9.61
49150.0	1993 JUN 11.5	1.02	260.1	0.0	79.3	23.1	5.45	194.7	1.30	238.3	-2.6	5.12	9.85	324.2	-1.28	152.6	12.9	9.45
49160.0	1993 JUN 21.5	1.02	269.7	0.0	89.6	23.4	5.45	195.4	1.30	239.0	-2.6	5.27	9.84	324.5	-1.29	152.9	12.8	9.30
49170.0	1993 JUL 1.5	1.02	279.2	0.0	100.0	23.1	5.45	196.2	1.30	239.8	-2.7	5.43	9.84	324.8	-1.30	153.2	12.7	9.16
49180.0	1993 JUL 11.5	1.02	288.7	0.0	110.3	22.1	5.45	197.0	1.30	240.5	-2.7	5.58	9.84	325.1	-1.31	153.5	12.6	9.04
49190.0	1993 JUL 21.5	1.02	298.3	0.0	120.4	20.5	5.45	197.7	1.29	241.3	-2.7	5.73	9.84	325.5	-1.33	153.8	12.4	8.95
49200.0	1993 AUG 0.5	1.02	307.8	0.0	130.3	18.3	5.45	198.5	1.29	242.1	-2.7	5.87	9.83	325.8	-1.34	154.1	12.3	8.87
49210.0	1993 AUG 10.5	1.01	317.4	0.0	139.9	15.6	5.45	199.2	1.29	242.8	-2.7	6.00	9.83	326.1	-1.35	154.4	12.2	8.83
49220.0	1993 AUG 20.5	1.01	327.0	0.0	149.2	12.5	5.45	200.0	1.29	243.6	-2.7	6.12	9.83	326.4	-1.36	154.7	12.1	8.82
49230.0	1993 AUG 30.5	1.01	336.7	0.0	158.4	9.1	5.45	200.7	1.28	244.3	-2.8	6.22	9.83	326.7	-1.37	155.0	11.9	8.83
49240.0	1993 SEP 9.5	1.01	346.3	0.0	167.5	5.4	5.45	201.5	1.28	245.1	-2.8	6.30	9.82	327.0	-1.38	155.3	11.8	8.88
49250.0	1993 SEP 19.5	1.00	356.1	0.0	176.4	1.5	5.45	202.2	1.28	245.8	-2.8	6.37	9.82	327.3	-1.39	155.6	11.7	8.95
49260.0	1993 SEP 29.5	1.00	5.9	0.0	185.4	-2.3	5.45	203.0	1.27	246.6	-2.9	6.41	9.82	327.7	-1.41	155.9	11.5	9.05
49270.0	1993 OCT 9.5	1.00	15.7	0.0	194.5	-5.2	5.45	203.8	1.27	247.3	-2.8	6.44	9.82	328.0	-1.42	156.2	11.4	9.18
49280.0	1993 OCT 19.5	1.00	25.6	0.0	203.8	-9.9	5.45	204.5	1.26	248.1	-2.8	6.45	9.81	328.3	-1.43	156.5	11.3	9.32
49290.0	1993 OCT 29.5	0.99	35.6	0.0	213.3	-13.4	5.45	205.3	1.26	248.9	-2.9	6.43	9.81	328.6	-1.44	156.8	11.2	9.47
49300.0	1993 NOV 8.5	0.99	45.6	0.0	223.2	-16.5	5.45	206.0	1.25	249.6	-2.9	6.39	9.81	328.9	-1.45	157.1	11.0	9.63
49310.0	1993 NOV 18.5	0.99	55.7	0.0	233.4	-19.2	5.45	206.8	1.25	250.4	-2.9	6.33	9.81	329.2	-1.46	157.4	10.9	9.80
49320.0	1993 NOV 28.5	0.99	65.8	0.0	243.9	-21.3	5.45	207.5	1.24	251.1	-2.9	6.25	9.80	329.6	-1.47	157.6	10.8	9.96
49330.0	1993 DEC 8.5	0.98	75.9	0.0	254.8	-22.7	5.45	208.3	1.24	251.9	-2.9	6.15	9.80	329.9	-1.48	157.9	10.6	10.12
49340.0	1993 DEC 18.5	0.98	86.1	0.0	265.8	-23.4	5.44	209.1	1.23	252.7	-2.9	6.04	9.80	330.2	-1.49	158.2	10.5	10.27
49350.0	1993 DEC 28.5	0.98	96.3	0.0	276.9	-23.3	5.44	209.8	1.23	253.4	-2.9	5.91	9.80	330.5	-1.51	158.5	10.4	10.40
49360.0	1994 JAN 7.5	0.98	106.5	0.0	287.9	-22.4	5.44	210.6	1.22	254.2	-3.0	5.76	9.79	330.8	-1.52	158.8	10.2	10.52
49370.0	1994 JAN 17.5	0.98	116.7	0.0	298.7	-20.8	5.44	211.3	1.22	254.9	-3.0	5.61	9.79	331.1	-1.53	159.1	10.1	10.62
49380.0	1994 JAN 27.5	0.98	126.9	0.0	309.3	-18.5	5.44	212.1	1.21	255.7	-3.0	5.45	9.79	331.5	-1.54	159.4	10.0	10.69
49390.0	1994 FEB 6.5	0.99	137.0	0.0	319.5	-15.7	5.44	212.9	1.20	256.4	-3.0	5.29	9.79	331.8	-1.55	159.7	9.8	10.74
49400.0	1994 FEB 16.5	0.99	147.1	0.0	329.3	-12.5	5.44	213.6	1.20	257.2	-3.0	5.12	9.78	332.1	-1.56	160.0	9.7	10.77
49410.0	1994 FEB 26.5	0.99	157.2	0.0	338.9	-8.9	5.44	214.4	1.19	258.0	-3.0	4.97	9.78	332.4	-1.57	160.3	9.5	10.77
49420.0	1994 MAR 8.5	0.99	167.2	0.0	348.3	-5.0	5.44	215.1	1.18	258.7	-3.0	4.83	9.78	332.7	-1.58	160.6	9.4	10.74
49430.0	1994 MAR 18.5	1.00	177.2	0.0	357.4	-1.1	5.43	215.9	1.17	259.5	-3.0	4.70	9.77	333.0	-1.59	160.9	9.3	10.69
49440.0	1994 MAR 28.5	1.00	187.1	0.0	6.5	2.8	5.43	216.7	1.17	260.3	-3.0	4.59	9.77	333.4	-1.60	161.2	9.2	10.62
49450.0	1994 APR 7.5	1.00	197.0	0.0	15.7	6.7	5.43	217.4	1.16	261.0	-3.0	4.51	9.77	333.7	-1.61	161.5	9.0	10.52
49460.0	1994 APR 17.5	1.00	206.8	0.0	24.9	10.3	5.43	218.2	1.15	261.8	-3.0	4.45	9.77	334.0	-1.62	161.7	8.9	10.40
49470.0	1994 APR 27.5	1.01	216.5	0.0	34.2	13.7	5.43	218.9	1.14	262.5	-3.0	4.42	9.76	334.3	-1.63	162.0	8.8	10.27
49480.0	1994 MAY 7.5	1.01	226.2	0.0	43.8	15.7	5.43	219.7	1.13	263.3	-3.0	4.43	9.76	334.6	-1.64	162.3	8.6	10.13
49490.0	1994 MAY 17.5	1.01	235.9	0.0	53.6	19.2	5.43	220.5	1.13	264.1	-3.1	4.46	9.76	335.0	-1.66	162.6	8.5	9.97
49500.0	1994 MAY 27.5	1.01	245.5	0.0	63.5	21.2	5.42	221.2	1.12	264.8	-3.1	4.52	9.76	335.3	-1.67	162.9	8.4	9.80
49510.0	1994 JUN 6.5	1.01	255.1	0.0	73.8	22.6	5.42	222.0	1.11	265.6	-3.1	4.61	9.75	335.6	-1.68	163.2	8.2	9.64
49520.0	1994 JUN 16.5	1.02	264.6	0.0	84.2	23.3	5.42	222.8	1.10	266.4	-3.1	4.71	9.75	335.9	-1.69	163.5	8.1	9.47
49530.0	1994 JUN 26.5	1.02	274.2	0.0	94.6	23.4	5.42	223.5	1.09	267.1	-3.1	4.84	9.75	336.2	-1.70	163.8	7.9	9.31
49540.0	1994 JUL 6.5	1.02	283.7	0.0	104.9	22.7	5.42	224.3	1.08	267.9	-3.1	4.98	9.74	336.6	-1.71	164.1	7.8	9.17
49550.0	1994 JUL 16.5	1.02	293.2	0.0	115.1	21.4	5.41	225.1	1.07	268.7	-3.1	5.12	9.74	336.9	-1.72	164.4	7.7	9.03
49560.0	1994 JUL 26.5	1.02	302.8	0.0	125.1	19.5	5.41	225.8	1.06	269.4	-3.1	5.28	9.74	337.2	-1.73	164.7	7.5	8.92
49570.0	1994 AUG 5.5	1.01	312.4	0.0	134.8	17.1	5.41	226.5	1.05	270.2	-3.1	5.43	9.74	337.5	-1.74	165.0	7.4	8.83
49580.0	1994 AUG 15.5	1.01	322.0	0.0	144.3	14.2	5.41	227.4	1.04	271.0	-3.1	5.58	9.73	337.8	-1.75	165.2	7.3	8.76
49590.0	1994 AUG 25.5	1.01	331.6	0.0	153.6	10.9	5.41	228.1	1.03	271.7	-3.1	5.73	9.73	338.2	-1.76	165.5	7.1	8.72
49600.0	1994 SEP 4.5	1.01	341.2	0.0	162.7	7.3	5.40	228.9	1.02	272.5	-3.1	5.86	9.73	338.5	-1.77	165.8	7.0	8.72
49610.0	1994 SEP 14.5	1.01	351.0	0.0	171.7	3.5	5.40	229.7	1.01	273.3	-3.1	5.99	9.72	338.8	-1.78	166.1	6.8	8.74
49620.0	1994 SEP 24.5	1.00	0.7	0.0	180.7	-0.3	5.40	230.4	0.99	274.1	-3.1	6.10	9.72	339.1	-1.79	166.4	6.7	8.80
49630.0	1994 OCT 4.5	1.00	10.6	0.0	189.7	-4.2	5.40	231.2	0.98	274.8	-3.1	6.19	9.72	339.4	-1.80	166.7	6.6	8.88
49640.0	1994 OCT 14.5	1.00	20.4	0.0	198.9	-8.0	5.40	232.0	0.97	275.6	-3.1	6.27	9.72	339.8	-1.81	167.0	6.4	8.98
49650.0	1994 OCT 24.5	0.99	30.4	0.0	208.3	-11.6	5.39	232.7	0.96	276.4	-3.0	6.32	9.71	340.1	-1.81	167.3	6.3	9.11
49660.0	1994 NOV 3.5	0.99	40.4	0.0	218.0	-14.9	5.39	233.5	0.95	277.1	-3.0	6.36	9.71	340.4	-1.82	167.6	6.1	9.25
49670.0	1994 NOV 13.5	0.99	50.4	0.0	228.0	-17.9	5.39	234.3	0.94	277.9	-3.0	6.38	9.71	340.7	-1.83	167.9	6.0	9.41
49680.0	1994 NOV 23.5	0.99	60.5	0.0	238.3	-20.3	5.39	235.1	0.92	278.7	-3.0	6.37	9.70	341.1	-1.84	168.2	5.9	9.57
49690.0	1994 DEC 3.5	0.99	70.6	0.0	249.0	-22.1	5.38	235.8	0.91	279.5	-3.0	6.34	9.70	341.4	-1.85	168.5	5.7	9.74
49700.0	1994 DEC 13.5	0.98	80.8	0.0	260.0	-23.1	5.38	236.6	0.90	280.2	-3.0	6.29	9.70	341.7	-1.86	168.7	5.6	9.90
49710.0	1994 DEC 23.5	0.98	90.9	0.0	271.1	-23.4	5.38	237.4	0.88	281.0	-3.0	6.22	9.70	342.0	-1.87	169.0	5.4	10.06
49720.0	1995 JAN 2.5	0.98	101.1	0.0	282.1	-23.0	5.38	238.2	0.87	281.8	-3.0	6.13	9.69	342.3	-1.88	169.3	5.3	10.20
49730.0	1995 JAN 12.5	0.98	111.3	0.0	293.1	-21.8	5.37	238.9	0.86	282.6	-3.0	6.02	9.69	342.7	-1.89	169.6	5.1	10.33
49740.0	1995 JAN 22.5	0.98	121.5	0.0	303.8	-19.8	5.37	239.7	0.84	283.4	-3.0	5.90	9.69	343.0	-1.90	169.9	5.0	10.44
49750.0	1995 FEB 1.5	0.99	131.7	0.0	314.2	-17.3	5.37	240.5	0.83	284.1	-3.0	5.76	9.68	343.3	-1.91	170.2	4.9	10.54
49760.0	1995 FEB 11.5	0.99	141.8	0.0	324.2	-14.2	5.37	241.3	0.82	284.9	-3.0	5.61	9.68	343.6	-1.92	170.5	4.7	10.60
49770.0	1995 FEB 21.5	0.99	151.9	0.0	333.9	-10.8	5.36	242.1	0.80	285.7	-3.0	5.46	9.68	344.0	-1.93	170.8	4.6	10.65
49780.0	1995 MAR 3.5	0.99	162.0	0.0	343.4	-7.1	5.36	242.8	0.79	286.5	-2.9	5.29	9.68	344.3	-1.93	171.1	4.4	10.67
49790.0	1995 MAR 13.5	0.99	172.0	0.0	352.6	-3.2	5.36	243.6	0.78	287.3	-2.9	5.13	9.67	344.6	-1.94	171.4	4.3	10.66
49800.0	1995 MAR 23.5	1.00	181.9	0.0	1.8	0.8	5.35	244.4	0.76	288.0	-2.9	4.97	9.67	344.9	-1.95	171.7	4.1	10.63
49810.0	1995 APR 2.5	1.00	191.8	0.0	10.9	4.7	5.35	245.2	0.75	288.8	-2.9	4.82	9.67	345.3	-1.96	172.0	4.0	10.57
49820.0	1995 APR 12.5	1.00	201.6	0.0	20.0	8.4	5.35	246.0	0.73	289.6	-2.9	4.68	9.66	345.6	-1.97	172.3	3.9	10.49
49830.0	1995 APR 22.5	1.01	211.4	0.0	29.3	12.0	5.35	246.8	0.72	290.4	-2.9	4.56	9.66	345.9	-1.98	172.5	3.7	10.39
49840.0	1995 MAY 2.5	1.01	221.1	0.0	38.7	15.2	5.34	247.6	0.70	291.2	-2.9	4.46	9.66	346.2	-1.99	172.8	3.6	10.27

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
49000.0	1993 JAN 12.5	19.57	287.7	-0.43	192.6	57.6	20.55	30.17	288.2	0.70	279.6	-28.5	31.15	29.62	233.0	14.51	187.6	0.0	30.13
49010.0	1993 JAN 22.5	19.57	287.8	-0.43	192.6	57.5	20.53	30.17	288.3	0.69	279.7	-28.5	31.13	29.62	233.1	14.50	187.7	0.0	29.98
49020.0	1993 FEB 1.5	19.57	287.9	-0.43	192.5	57.4	20.47	30.17	288.3	0.69	279.7	-28.4	31.07	29.62	233.1	14.49	187.8	0.0	29.82
49030.0	1993 FEB 11.5	19.57	288.1	-0.44	192.5	57.3	20.40	30.17	288.4	0.69	279.8	-28.4	30.99	29.63	233.2	14.48	187.8	0.0	29.66
49040.0	1993 FEB 21.5	19.58	288.2	-0.44	192.4	57.2	20.30	30.17	288.5	0.69	279.9	-28.4	30.89	29.63	233.3	14.47	187.9	0.0	29.49
49050.0	1993 MAR 3.5	19.58	288.3	-0.44	192.3	57.1	20.17	30.17	288.5	0.69	280.0	-28.4	30.76	29.63	233.3	14.46	188.0	0.0	29.33
49060.0	1993 MAR 13.5	19.58	288.4	-0.44	192.3	57.0	20.03	30.17	288.6	0.69	280.0	-28.4	30.62	29.63	233.4	14.45	188.0	0.0	29.17
49070.0	1993 MAR 23.5	19.58	288.5	-0.44	192.2	55.9	19.88	30.17	288.6	0.68	280.1	-28.4	30.46	29.63	233.5	14.43	188.1	0.0	29.03
49080.0	1993 APR 2.5	19.58	288.6	-0.44	192.2	55.7	19.72	30.17	288.7	0.68	280.2	-28.4	30.29	29.63	233.5	14.42	188.2	0.0	28.91
49090.0	1993 APR 12.5	19.58	288.7	-0.44	192.1	55.5	19.55	30.17	288.8	0.68	280.2	-28.4	30.12	29.63	233.6	14.41	188.3	0.0	28.81
49100.0	1993 APR 22.5	19.59	288.8	-0.44	192.1	55.5	19.38	30.17	288.8	0.68	280.3	-28.4	29.96	29.63	233.7	14.40	188.3	0.0	28.73
49110.0	1993 MAY 2.5	19.59	289.0	-0.45	192.0	55.4	19.22	30.17	288.9	0.68	280.4	-28.4	29.79	29.63	233.7	14.39	188.4	0.0	28.68
49120.0	1993 MAY 12.5	19.59	289.1	-0.45	192.0	55.3	19.07	30.17	288.9	0.68	280.4	-28.4	29.64	29.63	233.8	14.38	188.5	0.0	28.66
49130.0	1993 MAY 22.5	19.59	289.2	-0.45	191.9	55.2	18.93	30.17	289.0	0.67	280.5	-28.4	29.50	29.64	233.9	14.37	188.5	0.0	28.66
49140.0	1993 JUN 1.5	19.59	289.3	-0.45	191.9	55.1	18.81	30.17	289.1	0.67	280.6	-28.4	29.38	29.64	234.0	14.36	188.6	0.0	28.70
49150.0	1993 JUN 11.5	19.59	289.4	-0.45	191.8	55.0	18.71	30.17	289.1	0.67	280.6	-28.4	29.28	29.64	234.0	14.34	188.7	0.0	28.76
49160.0	1993 JUN 21.5	19.59	289.5	-0.45	191.8	55.9	18.64	30.17	289.2	0.67	280.7	-28.4	29.21	29.64	234.1	14.33	188.7	0.0	28.84
49170.0	1993 JUL 1.5	19.60	289.6	-0.45	191.7	55.8	18.60	30.16	289.2	0.67	280.8	-28.4	29.16	29.64	234.2	14.32	188.8	0.0	28.95
49180.0	1993 JUL 11.5	19.60	289.7	-0.45	191.7	55.7	18.58	30.16	289.3	0.67	280.8	-28.4	29.15	29.64	234.2	14.31	188.9	0.0	29.08
49190.0	1993 JUL 21.5	19.60	289.9	-0.46	191.5	55.6	18.60	30.16	289.4	0.66	280.9	-28.4	29.16	29.64	234.3	14.30	188.9	0.0	29.22
49200.0	1993 AUG 0.5	19.60	290.0	-0.46	191.6	55.4	18.64	30.16	289.4	0.66	281.0	-28.4	29.20	29.64	234.4	14.29	189.0	0.0	29.38
49210.0	1993 AUG 10.5	19.60	290.1	-0.46	191.5	55.3	18.71	30.16	289.5	0.66	281.0	-28.4	29.27	29.64	234.4	14.28	189.1	0.0	29.54
49220.0	1993 AUG 20.5	19.60	290.2	-0.46	191.5	55.2	18.80	30.16	289.5	0.66	281.1	-28.3	29.37	29.64	234.5	14.27	189.1	0.0	29.70
49230.0	1993 AUG 30.5	19.61	290.3	-0.46	191.5	55.1	18.92	30.16	289.6	0.66	281.2	-28.3	29.49	29.65	234.6	14.25	189.2	0.0	29.87
49240.0	1993 SEP 9.5	19.61	290.4	-0.46	191.4	55.0	19.06	30.16	289.7	0.66	281.2	-28.3	29.62	29.65	234.7	14.24	189.3	0.0	30.02
49250.0	1993 SEP 19.5	19.61	290.5	-0.46	191.4	54.9	19.22	30.16	289.7	0.65	281.3	-28.3	29.77	29.65	234.7	14.23	189.3	0.0	30.17
49260.0	1993 SEP 29.5	19.61	290.6	-0.46	191.3	54.8	19.38	30.16	289.8	0.65	281.4	-28.3	29.94	29.65	234.8	14.22	189.4	0.0	30.30
49270.0	1993 OCT 9.5	19.61	290.8	-0.46	191.3	54.7	19.55	30.16	289.8	0.65	281.4	-28.3	30.11	29.65	234.9	14.21	189.5	0.0	30.41
49280.0	1993 OCT 19.5	19.61	290.9	-0.47	191.2	54.6	19.72	30.16	289.9	0.65	281.5	-28.3	30.28	29.65	234.9	14.20	189.6	0.0	30.50
49290.0	1993 OCT 29.5	19.62	291.0	-0.47	191.2	54.5	19.89	30.16	289.9	0.65	281.6	-28.3	30.45	29.65	235.0	14.18	189.6	0.0	30.56
49300.0	1993 NOV 8.5	19.62	291.1	-0.47	191.1	54.4	20.05	30.16	290.0	0.65	281.6	-28.3	30.60	29.65	235.1	14.17	189.7	0.0	30.60
49310.0	1993 NOV 18.5	19.62	291.2	-0.47	191.1	54.2	20.19	30.16	290.1	0.64	281.7	-28.3	30.75	29.66	235.1	14.16	189.8	0.0	30.51
49320.0	1993 NOV 28.5	19.62	291.3	-0.47	191.0	54.1	20.32	30.16	290.1	0.64	281.8	-28.3	30.87	29.66	235.2	14.15	189.8	0.0	30.60
49330.0	1993 DEC 8.5	19.62	291.4	-0.47	191.0	54.0	20.43	30.16	290.2	0.64	281.8	-28.3	30.98	29.66	235.3	14.14	189.9	0.0	30.55
49340.0	1993 DEC 18.5	19.62	291.5	-0.47	191.0	53.9	20.52	30.16	290.2	0.64	281.9	-28.3	31.06	29.66	235.3	14.13	190.0	0.0	30.48
49350.0	1993 DEC 28.5	19.63	291.6	-0.47	190.9	53.8	20.58	30.16	290.3	0.64	282.0	-28.3	31.12	29.66	235.4	14.11	190.0	0.0	30.39
49360.0	1994 JAN 7.5	19.63	291.8	-0.48	190.9	53.7	20.61	30.16	290.4	0.64	282.0	-28.3	31.14	29.66	235.5	14.10	190.1	0.0	30.27
49370.0	1994 JAN 17.5	19.63	291.9	-0.48	190.8	53.6	20.61	30.16	290.4	0.63	282.1	-28.3	31.14	29.66	235.6	14.09	190.2	0.0	30.14
49380.0	1994 JAN 27.5	19.63	292.0	-0.48	190.8	53.5	20.58	30.16	290.5	0.63	282.2	-28.3	31.11	29.66	235.6	14.08	190.2	0.0	29.99
49390.0	1994 FEB 6.5	19.63	292.1	-0.48	190.7	53.4	20.53	30.16	290.5	0.63	282.2	-28.2	31.05	29.67	235.7	14.07	190.3	0.0	29.83
49400.0	1994 FEB 16.5	19.63	292.2	-0.48	190.7	53.3	20.45	30.16	290.6	0.63	282.3	-28.2	30.96	29.67	235.8	14.06	190.4	0.0	29.66
49410.0	1994 FEB 26.5	19.63	292.3	-0.48	190.6	53.2	20.35	30.16	290.7	0.63	282.4	-28.2	30.85	29.67	235.8	14.04	190.4	0.0	29.49
49420.0	1994 MAR 8.5	19.64	292.4	-0.48	190.6	53.0	20.22	30.16	290.7	0.62	282.4	-28.2	30.72	29.67	235.9	14.03	190.5	0.0	29.33
49430.0	1994 MAR 18.5	19.64	292.5	-0.48	190.6	52.9	20.08	30.16	290.8	0.62	282.5	-28.2	30.57	29.67	236.0	14.02	190.6	0.0	29.18
49440.0	1994 MAR 28.5	19.64	292.7	-0.49	190.5	52.8	19.93	30.16	290.8	0.62	282.6	-28.2	30.41	29.67	236.0	14.01	190.6	0.0	29.05
49450.0	1994 APR 7.5	19.64	292.8	-0.49	190.5	52.7	19.77	30.16	290.9	0.62	282.6	-28.2	30.24	29.67	236.1	14.00	190.7	0.0	28.93
49460.0	1994 APR 17.5	19.64	292.9	-0.49	190.4	52.5	19.60	30.16	291.0	0.62	282.7	-28.2	30.07	29.67	236.2	13.99	190.8	0.0	28.83
49470.0	1994 APR 27.5	19.64	293.0	-0.49	190.4	52.5	19.43	30.16	291.0	0.62	282.8	-28.2	29.90	29.68	236.2	13.97	190.8	0.0	28.76
49480.0	1994 MAY 7.5	19.65	293.1	-0.49	190.4	52.4	19.27	30.16	291.1	0.61	282.8	-28.2	29.74	29.68	236.3	13.96	190.9	0.0	28.71
49490.0	1994 MAY 17.5	19.65	293.2	-0.49	190.3	52.3	19.12	30.16	291.1	0.61	282.9	-28.2	29.59	29.68	236.4	13.95	191.0	0.0	28.70
49500.0	1994 MAY 27.5	19.65	293.3	-0.49	190.3	52.2	18.98	30.16	291.2	0.61	283.0	-28.2	29.46	29.68	236.4	13.94	191.0	0.0	28.71
49510.0	1994 JUN 6.5	19.65	293.4	-0.49	190.2	52.1	18.86	30.16	291.3	0.61	283.0	-28.2	29.34	29.68	236.5	13.93	191.1	0.0	28.75
49520.0	1994 JUN 16.5	19.65	293.5	-0.49	190.2	52.0	18.77	30.16	291.3	0.61	283.1	-28.2	29.25	29.68	236.6	13.91	191.2	0.0	28.82
49530.0	1994 JUN 26.5	19.65	293.7	-0.50	190.2	51.8	18.70	30.16	291.4	0.61	283.2	-28.2	29.19	29.68	236.7	13.90	191.3	0.0	28.91
49540.0	1994 JUL 6.5	19.65	293.8	-0.50	190.1	51.7	18.65	30.16	291.4	0.60	283.2	-28.2	29.15	29.69	236.7	13.89	191.3	0.0	29.02
49550.0	1994 JUL 16.5	19.66	293.9	-0.50	190.1	51.6	18.64	30.16	291.5	0.60	283.3	-28.1	29.14	29.69	236.8	13.88	191.4	0.0	29.15
49560.0	1994 JUL 26.5	19.66	294.0	-0.50	190.0	51.5	18.65	30.16	291.6	0.60	283.4	-28.1	29.16	29.69	236.9	13.87	191.5	0.0	29.30
49570.0	1994 AUG 5.5	19.66	294.1	-0.50	190.0	51.4	18.70	30.16	291.6	0.60	283.4	-28.1	29.21	29.69	236.9	13.85	191.5	0.0	29.46
49580.0	1994 AUG 15.5	19.66	294.2	-0.50	190.0	51.3	18.77	30.15	291.7	0.60	283.5	-28.1	29.28	29.69	237.0	13.84	191.6	0.0	29.62
49590.0	1994 AUG 25.5	19.66	294.3	-0.50	189.9	51.2	18.87	30.15	291.7	0.60	283.6	-28.1	29.39	29.69	237.1	13.83	191.7	0.0	29.79
49600.0	1994 SEP 4.5	19.66	294.4	-0.50	189.9	51.1	18.99	30.15	291.8	0.59	283.6	-28.1	29.51	29.69	237.1	13.82	191.7	0.0	29.95
49610.0	1994 SEP 14.5	19.67	294.6	-0.50	189.8	51.0	19.13	30.15	291.8	0.59	283.7	-28.1	29.65	29.70	237.2	13.80	191.8	0.0	30.10
49620.0	1994 SEP 24.5	19.67	294.7	-0.51	189.8	50.9	19.28	30.15	291.9	0.59	283.8	-28.1	29.81	29.70	237.3	13.79	191.9	0.0	30.25
49630.0	1994 OCT 4.5	19.67	294.8	-0.51	189.8	50.8	19.45	30.15	292.0	0.59	283.8	-28.1	29.97	29.70	237.3	13.78	191.9	0.0	30.37
49640.0	1994 OCT 14.5	19.67	294.9	-0.51	189.7	50.7	19.62	30.15	292.0	0.59	283.9	-28.1	30.14	29.70	237.4	13.77	192.0	0.0	30.48
49650.0	1994 OCT 24.5	19.67	295.0	-0.51	189.7	50.5	19.79	30.15	292.1	0.59	284.0	-28.1	30.31	29.70	237.5	13.76	192.1	0.0	30.56
49660.0	1994 NOV 3.5	19.67	295.1	-0.51	189.6	50.4	19.95	30.15	292.1	0.58	284.0	-28.1	30.48	29.70	237.6	13.74	192.1	0.0	30.63
49670.0	1994 NOV 13.5	19.67	295.2	-0.51	189.6	50.3	20.12	30.15	292.2	0.58	284.1	-28.1	30.63	29.70	237.6	13.73	192.2	0.0	30.66
49680.0	1994 NOV 23.5	19.68	295.3	-0.51	189.6	50.2	20.26	30.15	292.3	0.58	284.2	-28.1	30.77	29.71	237.7	13.72	192.3	0.0	30.66
49690.0	1994 DEC 3.5	19.68	295.4	-0.51	189.5	50.1	20.39	30.15	292.3	0.58	284.2	-28.1	30.89	29.71	237.8	13.71	192.3	0.0	30.64
49700.0	1994 DEC 13.5	19.68	295.6	-0.51	189.5	50.0	20.50	30.15	292.4	0.58	284.3	-28.0	30.99	29.71	237.8	13.69	192.4	0.0	30.59
49710.0	1994 DEC 23.5	19.68	295.7	-0.52	189.5	49.9	20.58	30.15	292.4	0.57	284.4	-28.0	31.07	29.71	237.9	13.68	192.5	0.0	30.52
49720.0	1995 JAN 2.5	19.68	295.8	-0.52	189.4	49.8	20.64	30.15	292.5	0.57	284.4	-28.0	31.12	29.71	238.0	13.67	192.5	0.0	30.42
49730.0	1995 JAN 12.5	19.68	295.9	-0.52	189.4	49.7	20.66	30.15	292.6	0.57	284.5	-28.0	31.13	29.71	238.0	13.66	192.6	0.0	30.29
49740.0	1995 JAN 22.5	19.69	296.0	-0.52	189.4	49.6	20.67	30.15	292.6	0.57	284.6	-28.0	31.12	29.71	238.1	13.65	192.7	0.0	30.16
49750.0	1995 FEB 1.5	19.69	296.1	-0.52	189.3	49.5	20.64	30.15	292.7	0.57	284.6	-28.0	31.08	29.72	238.2	13.63	192.7	0.0	30.00
49760.0	1995 FEB 11.5	19.69	296.2	-0.52	189.3	49.3	20.58	30.15	292.7	0.57	284.7	-28.0	31.02	29.72	238.2	13.62	192.8	0.0	29.84
49770.0	1995 FEB 21.5	19.69	296.3	-0.52	189.2	49.2	20.50	30.15	292.8	0.56	284.8	-28.0	30.92	29.72	238.3	13.61	192.9	0.0	29.68
49780.0	1995 MAR 3.5	19.69	296.4	-0.52	189.2	49.1	20.40	30.15	292.9	0.56	284.8	-28.0	30.81	29.72	238.4	13.60	193.0	0.0	29.51
49790.0	1995 MAR 13.5	19.69	296.6	-0.52	189.2	49.0	20.27	30.15	292.9	0.56	284.9	-28.0	30.67	29.72	238.4	13.58	193.0	0.0	29.35
49800.0	1995 MAR 23.5	19.69	296.7	-0.53	189.1	48.9	20.13	30.15	293.0	0.56	285.0	-28.0	30.52	29.72	238.5	13.57	193.1	0.0	29.20
49810.0	1995 APR 2.5	19.70	296.8	-0.53	189.1	48.8	19.98	30.15	293.0	0.56	285.0	-28.0	30.36	29.73	238.6	13.56	193.2	0.0	29.07
49820.0	1995 APR 12.5	19.70	296.9	-0.53	189.1	48.7	19.81	30.15	293.1	0.56	285.1	-28.0	30.19	29.73	238.7	13.55	193.2	0.0	28.96
49830.0	1995 APR 22.5	19.70	297.0	-0.53	189.0	48.6	19.65	30.15	293.2	0.55	285.2	-27.9	30.02	29.73	238.7	13.53	193.3	0.0	28.87
49840.0	1995 MAY 2.5	19.70	297.1	-0.53	189.0	48.5	19.48	30.15	293.2	0.55	285.2	-27.9	29.85	29.73	238.8	13.52	193.4	0.0	28.80

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER COIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN COIST
49850.0	1995 MAY 12.5	1.01	230.8	0.0	48.4	13.0	5.34	248.3	0.69	292.0	-2.8	4.39	9.65	346.6	-2.00	173.1	3.4	10.13
49860.0	1995 MAY 22.5	1.01	240.4	0.0	58.3	20.3	5.34	249.1	0.67	292.8	-2.8	4.34	9.65	346.9	-2.00	173.4	3.3	9.99
49870.0	1995 JUN 1.5	1.01	250.0	0.0	68.4	22.0	5.33	249.9	0.66	293.6	-2.8	4.32	9.65	347.2	-2.01	173.7	3.1	9.83
49880.0	1995 JUN 11.5	1.02	259.6	0.0	78.7	23.0	5.33	250.7	0.64	294.4	-2.8	4.33	9.65	347.5	-2.02	174.0	3.0	9.66
49890.0	1995 JUN 21.5	1.02	269.2	0.0	89.1	23.4	5.33	251.5	0.62	295.1	-2.8	4.37	9.64	347.9	-2.03	174.3	2.8	9.50
49900.0	1995 JUL 1.5	1.02	278.7	0.0	99.5	23.2	5.32	252.3	0.61	295.9	-2.8	4.44	9.64	348.2	-2.04	174.6	2.7	9.33
49910.0	1995 JUL 11.5	1.02	288.2	0.0	109.8	22.2	5.32	253.1	0.59	296.7	-2.7	4.53	9.64	348.5	-2.05	174.9	2.5	9.18
49920.0	1995 JUL 21.5	1.02	297.8	0.0	119.9	20.6	5.32	253.9	0.58	297.5	-2.7	4.64	9.63	348.9	-2.05	175.2	2.4	9.03
49930.0	1995 AUG 0.5	1.02	307.3	0.0	129.8	18.4	5.32	254.7	0.56	298.3	-2.7	4.77	9.63	349.2	-2.06	175.5	2.3	8.90
49940.0	1995 AUG 10.5	1.01	316.9	0.0	139.4	15.8	5.31	255.5	0.54	299.1	-2.7	4.91	9.63	349.5	-2.07	175.8	2.1	8.79
49950.0	1995 AUG 20.5	1.01	326.5	0.0	148.8	12.7	5.31	256.3	0.53	299.9	-2.7	5.06	9.62	349.8	-2.08	176.1	2.0	8.71
49960.0	1995 AUG 30.5	1.01	336.2	0.0	157.9	9.2	5.31	257.1	0.51	300.7	-2.6	5.21	9.62	350.2	-2.09	176.4	1.8	8.55
49970.0	1995 SEP 9.5	1.01	345.8	0.0	167.0	5.5	5.30	257.9	0.49	301.5	-2.6	5.36	9.62	350.5	-2.09	176.7	1.7	8.62
49980.0	1995 SEP 19.5	1.00	355.6	0.0	176.0	1.7	5.30	258.7	0.48	302.3	-2.6	5.51	9.62	350.8	-2.10	176.9	1.5	8.62
49990.0	1995 SEP 29.5	1.00	5.4	0.0	185.0	-2.1	5.30	259.5	0.46	303.1	-2.6	5.65	9.61	351.2	-2.11	177.2	1.4	8.65
50000.0	1995 OCT 9.5	1.00	15.2	0.0	194.0	-6.0	5.29	260.3	0.44	303.9	-2.5	5.79	9.61	351.5	-2.12	177.5	1.2	8.70
50010.0	1995 OCT 19.5	1.00	25.1	0.0	203.3	-9.7	5.29	261.1	0.42	304.7	-2.5	5.91	9.61	351.8	-2.12	177.8	1.1	8.79
50020.0	1995 OCT 29.5	0.99	35.1	0.0	212.8	-13.2	5.29	261.9	0.41	305.5	-2.5	6.01	9.60	352.1	-2.13	178.1	0.9	8.90
50030.0	1995 NOV 8.5	0.99	45.1	0.0	222.7	-15.4	5.28	262.7	0.39	306.3	-2.5	6.10	9.60	352.5	-2.14	178.4	0.8	9.03
50040.0	1995 NOV 18.5	0.99	55.2	0.0	232.8	-19.1	5.28	263.5	0.37	307.1	-2.4	6.17	9.60	352.8	-2.15	178.7	0.6	9.18
50050.0	1995 NOV 28.5	0.99	65.3	0.0	243.4	-21.2	5.28	264.3	0.35	307.9	-2.4	6.22	9.59	353.1	-2.15	179.0	0.5	9.34
50060.0	1995 DEC 8.5	0.99	75.4	0.0	254.2	-22.7	5.27	265.1	0.34	308.7	-2.4	6.25	9.59	353.5	-2.16	179.3	0.3	9.50
50070.0	1995 DEC 18.5	0.98	85.6	0.0	265.2	-23.4	5.27	265.9	0.32	309.6	-2.4	6.25	9.59	353.8	-2.17	179.6	0.2	9.67
50080.0	1995 DEC 28.5	0.98	95.8	0.0	276.3	-23.3	5.27	266.7	0.30	310.4	-2.3	6.24	9.58	354.1	-2.17	179.9	0.1	9.83
50090.0	1996 JAN 7.5	0.98	106.0	0.0	287.3	-22.5	5.26	267.5	0.28	311.2	-2.3	6.20	9.58	354.5	-2.18	180.2	-0.1	9.98
50100.0	1996 JAN 17.5	0.98	116.2	0.0	298.2	-20.9	5.26	268.3	0.27	312.0	-2.3	6.15	9.58	354.8	-2.19	180.5	-0.2	10.13
50110.0	1996 JAN 27.5	0.98	126.3	0.0	308.7	-18.7	5.25	269.1	0.25	312.8	-2.3	6.07	9.58	355.1	-2.19	180.8	-0.4	10.25
50120.0	1996 FEB 6.5	0.99	136.5	0.0	319.0	-15.9	5.25	270.0	0.23	313.6	-2.2	5.97	9.57	355.5	-2.20	181.1	-0.5	10.36
50130.0	1996 FEB 16.5	0.99	146.6	0.0	328.8	-12.6	5.25	270.8	0.21	314.4	-2.2	5.86	9.57	355.8	-2.21	181.4	-0.7	10.44
50140.0	1996 FEB 26.5	0.99	156.7	0.0	338.4	-9.1	5.24	271.6	0.19	315.2	-2.2	5.73	9.57	356.1	-2.22	181.7	-0.8	10.50
50150.0	1996 MAR 7.5	0.99	166.7	0.0	347.8	-5.2	5.24	272.4	0.17	316.1	-2.1	5.59	9.56	356.4	-2.22	182.0	-1.0	10.54
50160.0	1996 MAR 17.5	1.00	176.7	0.0	357.0	-1.3	5.24	273.2	0.16	316.9	-2.1	5.44	9.56	356.8	-2.23	182.3	-1.1	10.55
50170.0	1996 MAR 27.5	1.00	186.6	0.0	6.1	2.5	5.23	274.0	0.14	317.7	-2.1	5.28	9.56	357.1	-2.23	182.6	-1.3	10.54
50180.0	1996 APR 6.5	1.00	196.5	0.0	15.2	6.5	5.23	274.9	0.12	318.5	-2.0	5.12	9.55	357.4	-2.24	182.9	-1.4	10.50
50190.0	1996 APR 16.5	1.00	206.3	0.0	24.4	10.2	5.23	275.7	0.10	319.3	-2.0	4.96	9.55	357.8	-2.25	183.2	-1.6	10.44
50200.0	1996 APR 26.5	1.01	216.0	0.0	33.7	13.5	5.22	276.5	0.08	320.2	-2.0	4.81	9.55	358.1	-2.25	183.5	-1.7	10.36
50210.0	1996 MAY 6.5	1.01	225.7	0.0	43.3	15.5	5.22	277.3	0.06	321.0	-1.9	4.66	9.54	358.4	-2.26	183.8	-1.9	10.26
50220.0	1996 MAY 16.5	1.01	235.4	0.0	53.1	19.1	5.21	278.2	0.04	321.8	-1.9	4.52	9.54	358.8	-2.27	184.1	-2.0	10.13
50230.0	1996 MAY 26.5	1.01	245.0	0.0	63.1	21.1	5.21	279.0	0.02	322.6	-1.9	4.41	9.54	359.1	-2.27	184.4	-2.2	9.99
50240.0	1996 JUN 5.5	1.01	254.6	0.0	73.3	22.5	5.21	279.8	0.01	323.5	-1.8	4.31	9.54	359.4	-2.28	184.7	-2.3	9.84
50250.0	1996 JUN 15.5	1.02	264.1	0.0	83.6	23.3	5.20	280.6	-0.01	324.3	-1.8	4.24	9.53	359.8	-2.28	185.0	-2.5	9.68
50260.0	1996 JUN 25.5	1.02	273.7	0.0	94.0	23.4	5.20	281.5	-0.03	325.1	-1.8	4.20	9.53	0.1	-2.29	185.3	-2.6	9.52
50270.0	1996 JUL 5.5	1.02	283.2	0.0	104.4	22.8	5.20	282.3	-0.05	326.0	-1.7	4.18	9.53	0.5	-2.29	185.6	-2.8	9.35
50280.0	1996 JUL 15.5	1.02	292.8	0.0	114.6	21.5	5.19	283.1	-0.07	326.8	-1.7	4.19	9.52	0.8	-2.30	185.9	-2.9	9.19
50290.0	1996 JUL 25.5	1.02	302.3	0.0	124.6	19.7	5.19	284.0	-0.09	327.6	-1.6	4.24	9.52	1.1	-2.31	186.2	-3.1	9.04
50300.0	1996 AUG 4.5	1.01	311.9	0.0	134.3	17.2	5.19	284.8	-0.11	328.5	-1.6	4.31	9.52	1.5	-2.31	186.5	-3.2	8.89
50310.0	1996 AUG 14.5	1.01	321.5	0.0	143.9	14.4	5.18	285.6	-0.13	329.3	-1.6	4.40	9.51	1.8	-2.32	186.8	-3.4	8.77
50320.0	1996 AUG 24.5	1.01	331.1	0.0	153.1	11.1	5.18	286.5	-0.15	330.1	-1.5	4.51	9.51	2.1	-2.32	187.1	-3.5	8.66
50330.0	1996 SEP 3.5	1.01	340.7	0.0	162.3	7.5	5.17	287.3	-0.17	331.0	-1.5	4.65	9.51	2.5	-2.33	187.4	-3.7	8.58
50340.0	1996 SEP 13.5	1.01	350.5	0.0	171.3	3.8	5.17	288.2	-0.18	331.8	-1.4	4.79	9.50	2.8	-2.33	187.7	-3.8	8.53
50350.0	1996 SEP 23.5	1.00	0.2	0.0	180.2	-0.1	5.17	289.0	-0.20	332.6	-1.4	4.94	9.50	3.1	-2.34	188.0	-4.0	8.50
50360.0	1996 OCT 3.5	1.00	10.0	0.0	189.2	-4.0	5.16	289.8	-0.22	333.5	-1.4	5.09	9.50	3.5	-2.34	188.3	-4.1	8.51
50370.0	1996 OCT 13.5	1.00	19.9	0.0	198.4	-7.8	5.16	290.7	-0.24	334.3	-1.3	5.24	9.49	3.8	-2.35	188.6	-4.3	8.54
50380.0	1996 OCT 23.5	0.99	29.9	0.0	207.8	-11.4	5.16	291.5	-0.26	335.2	-1.3	5.39	9.49	4.2	-2.35	188.9	-4.4	8.61
50390.0	1996 NOV 2.5	0.99	39.8	0.0	217.5	-14.8	5.15	292.4	-0.28	336.0	-1.2	5.53	9.49	4.5	-2.36	189.2	-4.6	8.70
50400.0	1996 NOV 12.5	0.99	49.9	0.0	227.5	-17.7	5.15	293.2	-0.30	336.9	-1.2	5.66	9.49	4.8	-2.36	189.5	-4.7	8.81
50410.0	1996 NOV 22.5	0.99	60.0	0.0	237.8	-20.2	5.15	294.1	-0.32	337.7	-1.2	5.78	9.48	5.2	-2.37	189.8	-4.9	8.95
50420.0	1996 DEC 2.5	0.99	70.1	0.0	248.5	-22.0	5.14	294.9	-0.33	338.6	-1.1	5.88	9.48	5.5	-2.37	190.1	-5.0	9.10
50430.0	1996 DEC 12.5	0.98	80.2	0.0	259.4	-23.1	5.14	295.8	-0.35	339.4	-1.1	5.97	9.48	5.8	-2.38	190.4	-5.2	9.26
50440.0	1996 DEC 22.5	0.98	90.4	0.0	270.5	-23.4	5.13	296.6	-0.37	340.3	-1.0	6.03	9.47	6.2	-2.38	190.7	-5.3	9.43
50450.0	1997 JAN 1.5	0.98	100.6	0.0	281.6	-23.0	5.13	297.5	-0.39	341.1	-1.0	6.08	9.47	6.5	-2.38	191.0	-5.5	9.59
50460.0	1997 JAN 11.5	0.98	110.8	0.0	292.5	-21.8	5.13	298.3	-0.41	342.0	-1.0	6.10	9.47	6.9	-2.39	191.3	-5.6	9.75
50470.0	1997 JAN 21.5	0.98	121.0	0.0	303.2	-19.9	5.12	299.2	-0.43	342.8	-0.9	6.11	9.46	7.2	-2.39	191.6	-5.8	9.90
50480.0	1997 FEB 0.5	0.99	131.2	0.0	313.6	-17.4	5.12	300.0	-0.45	343.7	-0.9	6.09	9.46	7.5	-2.40	191.9	-5.9	10.04
50490.0	1997 FEB 10.5	0.99	141.3	0.0	323.7	-14.4	5.12	300.9	-0.46	344.5	-0.8	6.05	9.46	7.9	-2.40	192.2	-6.0	10.16
50500.0	1997 FEB 20.5	0.99	151.4	0.0	333.4	-11.0	5.11	301.7	-0.48	345.4	-0.8	5.99	9.45	8.2	-2.40	192.5	-6.2	10.26
50510.0	1997 MAR 2.5	0.99	161.4	0.0	342.9	-7.3	5.11	302.6	-0.50	346.2	-0.7	5.92	9.45	8.6	-2.41	192.9	-6.3	10.34
50520.0	1997 MAR 12.5	0.99	171.4	0.0	352.2	-3.4	5.11	303.5	-0.52	347.1	-0.7	5.82	9.45	8.9	-2.41	193.2	-6.5	10.40
50530.0	1997 MAR 22.5	1.00	181.4	0.0	1.3	0.5	5.10	304.3	-0.54	348.0	-0.6	5.71	9.45	9.2	-2.42	193.5	-6.6	10.43
50540.0	1997 APR 1.5	1.00	191.3	0.0	10.4	4.5	5.10	305.2	-0.55	348.8	-0.6	5.58	9.44	9.6	-2.42	193.8	-6.8	10.44
50550.0	1997 APR 11.5	1.00	201.1	0.0	19.5	8.3	5.10	306.1	-0.57	349.7	-0.5	5.44	9.44	9.9	-2.42	194.1	-6.9	10.42
50560.0	1997 APR 21.5	1.01	210.9	0.0	28.8	11.8	5.09	306.9	-0.59	350.6	-0.5	5.29	9.44	10.3	-2.43	194.4	-7.1	10.38
50570.0	1997 MAY 1.5	1.01	220.6	0.0	38.2	15.0	5.09	307.8	-0.61	351.4	-0.5	5.14	9.43	10.6	-2.43	194.7	-7.2	10.32
50580.0	1997 MAY 11.5	1.01	230.3	0.0	47.9	17.8	5.09	308.7	-0.63	352.3	-0.4	4.98	9.43	11.0	-2.43	195.0	-7.4	10.23
50590.0	1997 MAY 21.5	1.01	240.0	0.0	57.8	20.2	5.08	309.5	-0.64	353.2	-0.4	4.82	9.43	11.3	-2.44	195.3	-7.5	10.12
50600.0	1997 JUN 0.5	1.01	249.6	0.0	67.9	21.9	5.08	310.4	-0.66	354.0	-0.3	4.67	9.42	11.6	-2.44	195.6	-7.7	10.00
50610.0	1997 JUN 10.5	1.02	259.1	0.0	78.2	23.0	5.08	311.3	-0.68	354.9	-0.3	4.53	9.42	12.0	-2.44	196.0	-7.8	9.86
50620.0	1997 JUN 20.5	1.02	268.7	0.0	88.6	23.4	5.07	312.1	-0.69	355.8	-0.2	4.39	9.42	12.3	-2.44	196.3	-8.0	9.71
50630.0	1997 JUL 0.5	1.02	278.2	0.0	99.0	23.2	5.07	313.0	-0.71	356.6	-0.2	4.27	9.41	12.7	-2.45	196.6	-8.1	9.55
50640.0	1997 JUL 10.5	1.02	287.7	0.0	109.3	22.3	5.07	313.9	-0.73	357.5	-0.1	4.18	9.41	13.0	-2.45	196.9	-8.3	9.38
50650.0	1997 JUL 20.5	1.02	297.3	0.0	119.4	20.7	5.06	314.8	-0.74	358.4	-0.1	4.11	9.41	13.4	-2.45	197.2	-8.4	9.22
50660.0	1997 JUL 30.5	1.02	306.8	0.0	129.3	18.6	5.06	315.6	-0.76	359.3	-0.0	4.06	9.41	13.7	-2.46	197.5	-8.6	9.05
50670.0	1997 AUG 9.5	1.01	316.4	0.0	138.9	15.9	5.05	316.5	-0.78	0.1	0.0	4.04	9.40	14.0	-2.46	197.8	-8.7	8.90
50680.0	1997 AUG 19.5	1.01	326.0	0.0	148.3	12.8	5.05	317.4	-0.79	1.0	0.1	4.06	9.40	14.4	-2.46	198.2	-8.9	8.76
50690.0	1997 AUG 29.5	1.01	335.7	0.0	157.5	9.4	5.05	318.3	-0.81	1.9	0.1	4.10	9.40	14.7	-2.46	198.5	-9.0	8.64

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	URANUS LONG	URANUS LAT	URANUS RAS	URANUS DECS	URANUS CDIST	NEPTUNE R	NEPTUNE LONG	NEPTUNE LAT	NEPTUNE RAS	NEPTUNE DECS	NEPTUNE CDIST	PLUTO R	PLUTO LONG	PLUTO LAT	PLUTO RAS	PLUTO DECS	PLUTO CDIST
49850.0	1995 MAY 12.5	19.70	297.2	-0.53	188.0	48.4	19.32	30.15	293.3	0.55	285.3	-27.9	29.69	29.73	238.9	13.51	193.4	0.0	28.76
49860.0	1995 MAY 22.5	19.70	297.3	-0.53	188.0	48.3	19.17	30.15	293.3	0.55	285.4	-27.9	29.55	29.73	238.9	13.50	193.5	0.0	28.75
49870.0	1995 JUN 1.5	19.70	297.4	-0.53	188.0	48.1	19.03	30.15	293.4	0.55	285.4	-27.9	29.42	29.74	239.0	13.48	193.6	0.0	28.77
49880.0	1995 JUN 11.5	19.71	297.6	-0.53	188.0	48.0	18.92	30.15	293.5	0.54	285.5	-27.9	29.31	29.74	239.1	13.47	193.6	0.0	28.82
49890.0	1995 JUN 21.5	19.71	297.7	-0.54	188.0	47.9	18.82	30.15	293.5	0.54	285.6	-27.9	29.22	29.74	239.1	13.46	193.7	0.0	28.89
49900.0	1995 JUL 1.5	19.71	297.8	-0.54	188.0	47.8	18.75	30.15	293.6	0.54	285.6	-27.9	29.17	29.74	239.2	13.44	193.8	0.0	28.99
49910.0	1995 JUL 11.5	19.71	297.9	-0.54	188.0	47.7	18.71	30.15	293.6	0.54	285.7	-27.9	29.13	29.74	239.3	13.43	193.8	0.0	29.10
49920.0	1995 JUL 21.5	19.71	298.0	-0.54	188.0	47.6	18.70	30.15	293.7	0.54	285.8	-27.9	29.13	29.74	239.3	13.42	193.9	0.0	29.24
49930.0	1995 AUG 0.5	19.71	298.1	-0.54	188.0	47.5	18.71	30.15	293.8	0.54	285.8	-27.9	29.16	29.75	239.4	13.41	194.0	0.0	29.39
49940.0	1995 AUG 10.5	19.71	298.2	-0.54	188.0	47.4	18.76	30.15	293.8	0.53	285.9	-27.9	29.22	29.75	239.5	13.39	194.0	0.0	29.55
49950.0	1995 AUG 20.5	19.72	298.3	-0.54	188.0	47.3	18.83	30.15	293.9	0.53	286.0	-27.9	29.30	29.75	239.5	13.38	194.1	0.0	29.71
49960.0	1995 AUG 30.5	19.72	298.4	-0.54	188.0	47.2	18.93	30.15	293.9	0.53	286.0	-27.8	29.41	29.75	239.6	13.37	194.2	0.0	29.88
49970.0	1995 SEP 9.5	19.72	298.6	-0.54	188.0	47.1	19.05	30.15	294.0	0.53	286.1	-27.8	29.53	29.75	239.7	13.36	194.2	0.0	30.04
49980.0	1995 SEP 19.5	19.72	298.7	-0.55	188.0	47.0	19.19	30.14	294.0	0.53	286.2	-27.8	29.68	29.75	239.7	13.34	194.3	0.0	30.19
49990.0	1995 SEP 29.5	19.72	298.8	-0.55	188.0	46.8	19.35	30.14	294.1	0.53	286.2	-27.8	29.84	29.76	239.8	13.33	194.4	0.0	30.33
50000.0	1995 OCT 9.5	19.72	298.9	-0.55	188.0	46.7	19.51	30.14	294.2	0.52	286.3	-27.8	30.01	29.76	239.9	13.32	194.4	0.0	30.46
50010.0	1995 OCT 19.5	19.73	299.0	-0.55	188.0	46.6	19.68	30.14	294.2	0.52	286.4	-27.8	30.18	29.76	240.0	13.30	194.5	0.0	30.56
50020.0	1995 OCT 29.5	19.73	299.1	-0.55	188.0	46.5	19.85	30.14	294.3	0.52	286.4	-27.8	30.35	29.76	240.0	13.29	194.6	0.0	30.64
50030.0	1995 NOV 8.5	19.73	299.2	-0.55	188.0	46.4	20.02	30.14	294.3	0.52	286.5	-27.8	30.51	29.76	240.1	13.28	194.6	0.0	30.70
50040.0	1995 NOV 18.5	19.73	299.3	-0.55	188.0	46.3	20.18	30.14	294.4	0.52	286.6	-27.8	30.66	29.76	240.2	13.27	194.7	0.0	30.72
50050.0	1995 NOV 28.5	19.73	299.4	-0.55	188.0	46.2	20.32	30.14	294.5	0.52	286.6	-27.8	30.80	29.77	240.2	13.25	194.8	0.0	30.72
50060.0	1995 DEC 8.5	19.73	299.6	-0.55	188.0	46.1	20.45	30.14	294.5	0.51	286.7	-27.8	30.91	29.77	240.3	13.24	194.8	0.0	30.70
50070.0	1995 DEC 18.5	19.73	299.7	-0.55	188.0	46.0	20.56	30.14	294.6	0.51	286.8	-27.8	31.01	29.77	240.4	13.23	194.9	0.0	30.64
50080.0	1995 DEC 28.5	19.74	299.8	-0.56	188.0	45.9	20.64	30.14	294.6	0.51	286.8	-27.8	31.07	29.77	240.4	13.21	195.0	0.0	30.56
50090.0	1996 JAN 7.5	19.74	299.9	-0.56	188.0	45.8	20.69	30.14	294.7	0.51	286.9	-27.7	31.11	29.77	240.5	13.20	195.0	0.0	30.45
50100.0	1996 JAN 17.5	19.74	300.0	-0.56	188.0	45.7	20.72	30.14	294.8	0.51	287.0	-27.7	31.13	29.78	240.6	13.19	195.1	0.0	30.33
50110.0	1996 JAN 27.5	19.74	300.1	-0.56	188.1	45.5	20.72	30.14	294.8	0.50	287.0	-27.7	31.11	29.78	240.6	13.17	195.2	0.0	30.19
50120.0	1996 FEB 6.5	19.74	300.2	-0.56	188.1	45.4	20.69	30.14	294.9	0.50	287.1	-27.7	31.06	29.78	240.7	13.16	195.3	0.0	30.03
50130.0	1996 FEB 16.5	19.74	300.3	-0.56	188.1	45.3	20.63	30.14	294.9	0.50	287.2	-27.7	30.99	29.78	240.8	13.15	195.3	0.0	29.87
50140.0	1996 FEB 26.5	19.74	300.4	-0.56	188.0	45.2	20.55	30.14	295.0	0.50	287.2	-27.7	30.89	29.78	240.8	13.14	195.4	0.0	29.70
50150.0	1996 MAR 7.5	19.75	300.5	-0.56	188.0	45.1	20.45	30.14	295.1	0.50	287.3	-27.7	30.77	29.79	240.9	13.12	195.5	0.0	29.54
50160.0	1996 MAR 17.5	19.75	300.7	-0.56	188.0	45.0	20.32	30.14	295.1	0.50	287.4	-27.7	30.63	29.79	241.0	13.11	195.5	0.0	29.38
50170.0	1996 MAR 27.5	19.75	300.8	-0.57	187.9	44.9	20.18	30.14	295.2	0.49	287.4	-27.7	30.47	29.79	241.0	13.10	195.6	0.0	29.24
50180.0	1996 APR 6.5	19.75	300.9	-0.57	187.9	44.8	20.02	30.14	295.2	0.49	287.5	-27.7	30.31	29.79	241.1	13.08	195.7	0.0	29.11
50190.0	1996 APR 16.5	19.75	301.0	-0.57	187.9	44.7	19.86	30.14	295.3	0.49	287.6	-27.7	30.14	29.79	241.2	13.07	195.7	0.0	29.00
50200.0	1996 APR 26.5	19.75	301.1	-0.57	187.8	44.6	19.69	30.14	295.4	0.49	287.6	-27.6	29.97	29.79	241.2	13.06	195.8	0.0	28.91
50210.0	1996 MAY 6.5	19.75	301.2	-0.57	187.8	44.5	19.52	30.14	295.4	0.49	287.7	-27.6	29.80	29.80	241.3	13.04	195.9	0.0	28.85
50220.0	1996 MAY 16.5	19.75	301.3	-0.57	187.8	44.3	19.36	30.14	295.5	0.49	287.8	-27.6	29.65	29.80	241.4	13.03	195.9	0.0	28.82
50230.0	1996 MAY 26.5	19.76	301.4	-0.57	187.7	44.2	19.21	30.14	295.5	0.48	287.8	-27.6	29.50	29.80	241.4	13.02	196.0	0.0	28.82
50240.0	1996 JUN 5.5	19.76	301.5	-0.57	187.7	44.1	19.08	30.14	295.6	0.48	287.9	-27.6	29.38	29.80	241.5	13.00	196.1	0.0	28.84
50250.0	1996 JUN 15.5	19.76	301.7	-0.57	187.7	44.0	18.96	30.14	295.7	0.48	288.0	-27.6	29.28	29.80	241.6	12.99	196.1	0.0	28.89
50260.0	1996 JUN 25.5	19.76	301.8	-0.57	187.7	43.9	18.87	30.14	295.7	0.48	288.0	-27.6	29.20	29.81	241.7	12.98	196.2	0.0	28.97
50270.0	1996 JUL 5.5	19.76	301.9	-0.58	187.6	43.8	18.80	30.14	295.8	0.48	288.1	-27.6	29.15	29.81	241.7	12.96	196.3	0.0	29.07
50280.0	1996 JUL 15.5	19.76	302.0	-0.58	187.6	43.7	18.76	30.14	295.8	0.47	288.2	-27.6	29.12	29.81	241.8	12.95	196.3	0.0	29.20
50290.0	1996 JUL 25.5	19.76	302.1	-0.58	187.6	43.5	18.75	30.14	295.9	0.47	288.2	-27.6	29.13	29.81	241.9	12.94	196.4	0.0	29.34
50300.0	1996 AUG 4.5	19.77	302.2	-0.58	187.5	43.5	18.77	30.14	296.0	0.47	288.3	-27.6	29.16	29.81	241.9	12.92	196.5	0.0	29.49
50310.0	1996 AUG 14.5	19.77	302.3	-0.58	187.5	43.4	18.81	30.14	296.0	0.47	288.4	-27.6	29.23	29.82	242.0	12.91	196.5	0.0	29.65
50320.0	1996 AUG 24.5	19.77	302.4	-0.58	187.5	43.3	18.89	30.14	296.1	0.47	288.4	-27.5	29.31	29.82	242.1	12.90	196.6	0.0	29.82
50330.0	1996 SEP 3.5	19.77	302.5	-0.58	187.5	43.2	18.99	30.14	296.1	0.47	288.5	-27.5	29.43	29.82	242.1	12.88	196.7	0.0	29.98
50340.0	1996 SEP 13.5	19.77	302.6	-0.58	187.4	43.0	19.11	30.14	296.2	0.46	288.6	-27.5	29.56	29.82	242.2	12.87	196.7	0.0	30.15
50350.0	1996 SEP 23.5	19.77	302.8	-0.58	187.4	42.9	19.25	30.14	296.2	0.46	288.6	-27.5	29.71	29.82	242.3	12.86	196.8	0.0	30.30
50360.0	1996 OCT 3.5	19.77	302.9	-0.58	187.4	42.8	19.41	30.14	296.3	0.46	288.7	-27.5	29.87	29.83	242.3	12.84	196.9	0.0	30.43
50370.0	1996 OCT 13.5	19.78	303.0	-0.59	187.3	42.7	19.57	30.13	296.4	0.46	288.8	-27.5	30.04	29.83	242.4	12.83	196.9	0.0	30.55
50380.0	1996 OCT 23.5	19.78	303.1	-0.59	187.3	42.5	19.75	30.13	296.4	0.46	288.8	-27.5	30.21	29.83	242.5	12.82	197.0	0.0	30.65
50390.0	1996 NOV 2.5	19.78	303.2	-0.59	187.3	42.5	19.92	30.13	296.5	0.45	288.9	-27.5	30.38	29.83	242.5	12.80	197.1	0.0	30.73
50400.0	1996 NOV 12.5	19.78	303.3	-0.59	187.3	42.4	20.08	30.13	296.5	0.45	289.0	-27.5	30.54	29.83	242.6	12.79	197.1	0.0	30.78
50410.0	1996 NOV 22.5	19.78	303.4	-0.59	187.2	42.3	20.24	30.13	296.6	0.45	289.0	-27.5	30.69	29.84	242.7	12.78	197.2	0.0	30.80
50420.0	1996 DEC 2.5	19.78	303.5	-0.59	187.2	42.2	20.38	30.13	296.7	0.45	289.1	-27.5	30.82	29.84	242.7	12.76	197.3	0.0	30.79
50430.0	1996 DEC 12.5	19.78	303.6	-0.59	187.2	42.1	20.51	30.13	296.7	0.45	289.2	-27.4	30.93	29.84	242.8	12.75	197.3	0.0	30.76
50440.0	1996 DEC 22.5	19.78	303.7	-0.59	187.2	42.0	20.61	30.13	296.8	0.45	289.2	-27.4	31.02	29.84	242.9	12.74	197.4	0.0	30.70
50450.0	1997 JAN 1.5	19.79	303.9	-0.59	187.1	41.9	20.69	30.13	296.8	0.44	289.3	-27.4	31.08	29.85	242.9	12.72	197.5	0.0	30.61
50460.0	1997 JAN 11.5	19.79	304.0	-0.59	187.1	41.7	20.75	30.13	296.9	0.44	289.4	-27.4	31.11	29.85	243.0	12.71	197.5	0.0	30.50
50470.0	1997 JAN 21.5	19.79	304.1	-0.59	187.1	41.6	20.77	30.13	297.0	0.44	289.4	-27.4	31.11	29.85	243.1	12.70	197.6	0.0	30.37
50480.0	1997 FEB 0.5	19.79	304.2	-0.60	187.0	41.5	20.77	30.13	297.0	0.44	289.5	-27.4	31.09	29.85	243.1	12.68	197.7	0.0	30.23
50490.0	1997 FEB 10.5	19.79	304.3	-0.60	187.0	41.4	20.74	30.13	297.1	0.44	289.6	-27.4	31.03	29.85	243.2	12.67	197.7	0.0	30.07
50500.0	1997 FEB 20.5	19.79	304.4	-0.60	187.0	41.3	20.68	30.13	297.1	0.44	289.6	-27.4	30.95	29.86	243.3	12.65	197.8	0.0	29.90
50510.0	1997 MAR 2.5	19.79	304.5	-0.60	187.0	41.2	20.60	30.13	297.2	0.43	289.7	-27.4	30.85	29.86	243.3	12.64	197.9	0.0	29.74
50520.0	1997 MAR 12.5	19.80	304.6	-0.60	186.9	41.1	20.49	30.13	297.3	0.43	289.8	-27.4	30.72	29.86	243.4	12.63	197.9	0.0	29.58
50530.0	1997 MAR 22.5	19.80	304.7	-0.60	186.9	41.0	20.36	30.13	297.3	0.43	289.8	-27.3	30.58	29.86	243.5	12.61	198.0	0.0	29.42
50540.0	1997 APR 1.5	19.80	304.8	-0.60	186.9	40.9	20.22	30.13	297.4	0.43	289.9	-27.3	30.42	29.86	243.5	12.60	198.1	0.0	29.28
50550.0	1997 APR 11.5	19.80	305.0	-0.60	186.9	40.8	20.06	30.13	297.4	0.43	290.0	-27.3	30.26	29.87	243.6	12.59	198.1	0.0	29.15
50560.0	1997 APR 21.5	19.80	305.1	-0.60	186.8	40.7	19.90	30.13	297.5	0.42	290.0	-27.3	30.09	29.87	243.7	12.57	198.2	0.0	29.05
50570.0	1997 MAY 1.5	19.80	305.2	-0.60	186.8	40.6	19.73	30.13	297.6	0.42	290.1	-27.3	29.92	29.87	243.7	12.56	198.3	0.0	28.97
50580.0	1997 MAY 11.5	19.80	305.3	-0.60	186.8	40.5	19.57	30.13	297.6	0.42	290.2	-27.3	29.75	29.87	243.8	12.55	198.4	0.0	28.92
50590.0	1997 MAY 21.5	19.80	305.4	-0.61	186.8	40.3	19.41	30.13	297.7	0.42	290.2	-27.3	29.60	29.88	243.9	12.53	198.4	0.0	28.89
50600.0	1997 JUN 0.5	19.81	305.5	-0.61	186.7	40.2	19.26	30.13	297.7	0.42	290.3	-27.3	29.46	29.88	243.9	12.52	198.5	0.0	28.89
50610.0	1997 JUN 10.5	19.81	305.6	-0.61	186.7	40.1	19.12	30.13	297.8	0.42	290.4	-27.3	29.34	29.88	244.0	12.50	198.6	0.0	28.93
50620.0	1997 JUN 20.5	19.81	305.7	-0.61	186.7	40.0	19.01	30.13	297.9	0.41	290.4	-27.3	29.25	29.88	244.1	12.49	198.6	0.0	28.98
50630.0	1997 JUL 0.5	19.81	305.8	-0.61	186.7	39.9	18.92	30.13	297.9	0.41	290.5	-27.2	29.17	29.88	244.2	12.48	198.7	0.0	29.07
50640.0	1997 JUL 10.5	19.81	305.9	-0.61	186.6	39.8	18.85	30.13	298.0	0.41	290.6	-27.2	29.13	29.89	244.2	12.46	198.8	0.0	29.18
50650.0	1997 JUL 20.5	19.81	306.1	-0.61	186.6	39.7	18.81	30.13	298.0	0.41	290.6	-27.2	29.11	29.89	244.3	12.45	198.8	0.0	29.30
50660.0	1997 JUL 30.5	19.81	306.2	-0.61	186.6	39.6	18.80	30.13	298.1	0.41	290.7	-27.2	29.12	29.89	244.4	12.43	198.9	0.0	29.45
50670.0	1997 AUG 9.5	19.82	306.3	-0.61	186.5	39.5	18.82	30.13	298.2	0.40	290.8	-27.2	29.17	29.89	244.4	12.42	199.0	0.0	29.60
50680.0	1997 AUG 19.5	19.82	306.4	-0.61	186.5	39.4	18.87	30.13	298.2	0.40	290.8	-27.2	29.24	29.90	244.5	12.41	199.0	0.0	29.77
50690.0	1997 AUG 29.5	19.82	306.5	-0.61	186.5	39.3	18.94	30.13	298.3	0.40	290.9	-27.2	29.33	29.90	244.6	12.39	199.1	0.0	29.93

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
50700.0	1997 SEP 8.5	1.01	345.4	0.0	166.5	5.9	5.05	319.1	-0.82	2.8	0.1	4.17	9.39	15.1	-2.46	198.8	-9.1	8.53
50710.0	1997 SEP 18.5	1.00	355.1	0.0	175.5	1.9	5.05	320.0	-0.84	3.7	0.2	4.26	9.39	15.4	-2.47	199.1	-9.3	8.46
50720.0	1997 SEP 28.5	1.00	4.9	0.0	184.5	-1.9	5.04	320.9	-0.85	4.5	0.2	4.38	9.39	15.8	-2.47	199.4	-9.4	8.41
50730.0	1997 OCT 8.5	1.00	14.7	0.0	193.6	-5.8	5.04	321.8	-0.87	5.4	0.3	4.51	9.38	16.1	-2.47	199.7	-9.6	8.39
50740.0	1997 OCT 18.5	1.00	24.6	0.0	202.8	-9.5	5.04	322.7	-0.88	6.3	0.3	4.65	9.38	16.5	-2.47	200.1	-9.7	8.40
50750.0	1997 OCT 28.5	0.99	34.6	0.0	212.3	-13.1	5.03	323.6	-0.90	7.2	0.4	4.80	9.38	16.8	-2.47	200.4	-9.9	8.44
50760.0	1997 NOV 7.5	0.99	44.6	0.0	222.2	-15.2	5.03	324.5	-0.91	8.1	0.4	4.96	9.38	17.1	-2.48	200.7	-10.0	8.51
50770.0	1997 NOV 17.5	0.99	54.7	0.0	232.3	-18.9	5.03	325.3	-0.93	9.0	0.5	5.11	9.37	17.5	-2.48	201.0	-10.2	8.61
50780.0	1997 NOV 27.5	0.99	64.8	0.0	242.8	-21.1	5.03	326.2	-0.94	9.8	0.5	5.26	9.37	17.8	-2.48	201.3	-10.3	8.73
50790.0	1997 DEC 7.5	0.99	74.9	0.0	253.6	-22.6	5.02	327.1	-0.96	10.7	0.6	5.41	9.37	18.2	-2.48	201.6	-10.4	8.86
50800.0	1997 DEC 17.5	0.98	85.1	0.0	264.6	-23.4	5.02	328.0	-0.97	11.6	0.6	5.54	9.36	18.5	-2.48	202.0	-10.6	9.02
50810.0	1997 DEC 27.5	0.98	95.3	0.0	275.7	-23.3	5.02	328.9	-0.98	12.5	0.7	5.66	9.36	18.9	-2.48	202.3	-10.7	9.18
50820.0	1998 JAN 6.5	0.98	105.4	0.0	286.8	-22.6	5.02	329.8	-1.00	13.4	0.7	5.76	9.36	19.2	-2.48	202.6	-10.9	9.34
50830.0	1998 JAN 16.5	0.98	115.6	0.0	297.6	-21.0	5.01	330.7	-1.01	14.3	0.8	5.85	9.35	19.6	-2.48	202.9	-11.0	9.51
50840.0	1998 JAN 26.5	0.98	125.8	0.0	308.2	-18.8	5.01	331.6	-1.02	15.2	0.8	5.91	9.35	19.9	-2.49	203.3	-11.2	9.67
50850.0	1998 FEB 5.5	0.99	136.0	0.0	318.4	-15.1	5.01	332.5	-1.03	16.1	0.9	5.96	9.35	20.3	-2.49	203.6	-11.3	9.82
50860.0	1998 FEB 15.5	0.99	146.1	0.0	328.3	-12.8	5.01	333.4	-1.05	17.0	0.9	5.99	9.35	20.6	-2.49	203.9	-11.4	9.95
50870.0	1998 FEB 25.5	0.99	156.2	0.0	338.0	-9.2	5.00	334.3	-1.06	17.9	0.9	5.99	9.34	21.0	-2.49	204.2	-11.6	10.07
50880.0	1998 MAR 7.5	0.99	166.2	0.0	347.3	-5.4	5.00	335.2	-1.07	18.8	1.0	5.98	9.34	21.3	-2.49	204.6	-11.7	10.17
50890.0	1998 MAR 17.5	1.00	176.2	0.0	356.5	-1.5	5.00	336.1	-1.08	19.7	1.0	5.94	9.34	21.7	-2.49	204.9	-11.9	10.24
50900.0	1998 MAR 27.5	1.00	186.1	0.0	5.5	2.4	5.00	337.0	-1.09	20.6	1.1	5.89	9.33	22.0	-2.49	205.2	-12.0	10.30
50910.0	1998 APR 6.5	1.00	196.0	0.0	14.7	5.3	4.99	337.9	-1.10	21.5	1.1	5.81	9.33	22.4	-2.49	205.5	-12.2	10.33
50920.0	1998 APR 16.5	1.00	205.8	0.0	23.9	10.0	4.99	338.8	-1.12	22.4	1.2	5.72	9.33	22.7	-2.49	205.9	-12.3	10.33
50930.0	1998 APR 26.5	1.01	215.5	0.0	33.2	13.4	4.99	339.7	-1.13	23.3	1.2	5.62	9.32	23.1	-2.49	206.2	-12.4	10.31
50940.0	1998 MAY 6.5	1.01	225.2	0.0	42.8	16.4	4.99	340.6	-1.14	24.2	1.3	5.50	9.32	23.4	-2.49	206.5	-12.6	10.26
50950.0	1998 MAY 16.5	1.01	234.9	0.0	52.6	19.0	4.99	341.5	-1.15	25.1	1.3	5.36	9.32	23.8	-2.49	206.8	-12.7	10.20
50960.0	1998 MAY 26.5	1.01	244.5	0.0	62.6	21.1	4.98	342.4	-1.16	26.0	1.3	5.22	9.32	24.1	-2.49	207.2	-12.9	10.11
50970.0	1998 JUN 5.5	1.01	254.1	0.0	72.8	22.5	4.98	343.3	-1.17	26.9	1.4	5.07	9.31	24.5	-2.49	207.5	-13.0	10.00
50980.0	1998 JUN 15.5	1.02	263.7	0.0	83.1	23.3	4.98	344.2	-1.17	27.8	1.4	4.92	9.31	24.8	-2.49	207.8	-13.1	9.87
50990.0	1998 JUN 25.5	1.02	273.2	0.0	93.5	23.4	4.98	345.1	-1.18	28.7	1.5	4.76	9.31	25.2	-2.49	208.2	-13.3	9.73
51000.0	1998 JUL 5.5	1.02	282.7	0.0	103.9	22.8	4.98	346.0	-1.19	29.6	1.5	4.61	9.30	25.5	-2.49	208.5	-13.4	9.58
51010.0	1998 JUL 15.5	1.02	292.3	0.0	114.1	21.6	4.98	346.9	-1.20	30.5	1.6	4.46	9.30	25.9	-2.49	208.8	-13.5	9.42
51020.0	1998 JUL 25.5	1.02	301.8	0.0	124.1	19.8	4.97	347.8	-1.21	31.4	1.6	4.33	9.30	26.2	-2.49	209.2	-13.7	9.26
51030.0	1998 AUG 4.5	1.01	311.4	0.0	133.9	17.4	4.97	348.7	-1.22	32.3	1.6	4.21	9.30	26.6	-2.49	209.5	-13.8	9.09
51040.0	1998 AUG 14.5	1.01	321.0	0.0	143.4	14.5	4.97	349.6	-1.22	33.2	1.7	4.11	9.29	26.9	-2.48	209.8	-14.0	8.93
51050.0	1998 AUG 24.5	1.01	330.6	0.0	152.7	11.3	4.97	350.6	-1.23	34.1	1.7	4.03	9.29	27.3	-2.48	210.2	-14.1	8.78
51060.0	1998 SEP 3.5	1.01	340.3	0.0	161.8	7.7	4.97	351.5	-1.24	35.0	1.8	3.98	9.29	27.6	-2.48	210.5	-14.2	8.64
51070.0	1998 SEP 13.5	1.01	350.0	0.0	170.8	4.0	4.97	352.4	-1.24	36.0	1.8	3.96	9.28	28.0	-2.48	210.8	-14.4	8.52
51080.0	1998 SEP 23.5	1.00	359.7	0.0	179.8	0.1	4.97	353.3	-1.25	36.9	1.8	3.97	9.28	28.3	-2.48	211.2	-14.5	8.42
51090.0	1998 OCT 3.5	1.00	9.5	0.0	188.8	-3.8	4.96	354.2	-1.26	37.8	1.9	4.01	9.28	28.7	-2.48	211.5	-14.6	8.34
51100.0	1998 OCT 13.5	1.00	19.4	0.0	197.9	-7.6	4.96	355.1	-1.26	38.7	1.9	4.07	9.28	29.0	-2.48	211.8	-14.8	8.30
51110.0	1998 OCT 23.5	0.99	29.3	0.0	207.3	-11.3	4.95	356.0	-1.27	39.6	2.0	4.17	9.27	29.4	-2.48	212.2	-14.9	8.28
51120.0	1998 NOV 2.5	0.99	39.3	0.0	216.9	-14.6	4.96	356.9	-1.27	40.5	2.0	4.28	9.27	29.8	-2.47	212.5	-15.0	8.30
51130.0	1998 NOV 12.5	0.99	49.4	0.0	226.9	-17.5	4.96	357.8	-1.28	41.4	2.0	4.41	9.27	30.1	-2.47	212.9	-15.2	8.34
51140.0	1998 NOV 22.5	0.99	59.4	0.0	237.3	-20.0	4.95	358.8	-1.28	42.3	2.1	4.56	9.27	30.5	-2.47	213.2	-15.3	8.42
51150.0	1998 DEC 2.5	0.99	69.6	0.0	247.9	-21.9	4.96	359.7	-1.28	43.3	2.1	4.71	9.26	30.8	-2.47	213.5	-15.4	8.52
51160.0	1998 DEC 12.5	0.98	79.7	0.0	258.8	-23.1	4.95	0.6	-1.29	44.2	2.1	4.87	9.26	31.2	-2.47	213.9	-15.6	8.64
51170.0	1998 DEC 22.5	0.98	89.9	0.0	269.9	-23.4	4.95	1.5	-1.29	45.1	2.2	5.03	9.26	31.5	-2.46	214.2	-15.7	8.78
51180.0	1999 JAN 1.5	0.98	100.1	0.0	281.0	-23.1	4.96	2.4	-1.29	46.0	2.2	5.18	9.25	31.9	-2.46	214.6	-15.8	8.94
51190.0	1999 JAN 11.5	0.98	110.3	0.0	292.0	-21.9	4.95	3.3	-1.30	46.9	2.2	5.32	9.25	32.2	-2.46	214.9	-16.0	9.10
51200.0	1999 JAN 21.5	0.98	120.5	0.0	302.7	-20.1	4.95	4.2	-1.30	47.8	2.3	5.46	9.25	32.6	-2.46	215.3	-16.1	9.27
51210.0	1999 FEB 0.5	0.99	130.6	0.0	313.1	-17.6	4.95	5.2	-1.30	48.7	2.3	5.58	9.25	32.9	-2.45	215.6	-16.2	9.43
51220.0	1999 FEB 10.5	0.99	140.8	0.0	323.2	-14.6	4.95	6.1	-1.30	49.7	2.3	5.69	9.24	33.3	-2.45	215.9	-16.4	9.59
51230.0	1999 FEB 20.5	0.99	150.9	0.0	332.9	-11.2	4.95	7.0	-1.30	50.6	2.4	5.78	9.24	33.7	-2.45	216.3	-16.5	9.73
51240.0	1999 MAR 2.5	0.99	160.9	0.0	342.4	-7.5	4.95	7.9	-1.30	51.5	2.4	5.85	9.24	34.0	-2.45	216.6	-16.6	9.87
51250.0	1999 MAR 12.5	0.99	170.9	0.0	351.7	-3.6	4.95	8.8	-1.31	52.4	2.4	5.90	9.24	34.4	-2.44	217.0	-16.7	9.98
51260.0	1999 MAR 22.5	1.00	180.9	0.0	0.8	0.4	4.95	9.7	-1.31	53.3	2.5	5.94	9.23	34.7	-2.44	217.3	-16.9	10.08
51270.0	1999 APR 1.5	1.00	190.8	0.0	9.9	4.3	4.95	10.7	-1.31	54.2	2.5	5.95	9.23	35.1	-2.44	217.7	-17.0	10.15
51280.0	1999 APR 11.5	1.00	200.6	0.0	19.1	8.1	4.95	11.6	-1.30	55.2	2.5	5.94	9.23	35.4	-2.43	218.0	-17.1	10.20
51290.0	1999 APR 21.5	1.00	210.4	0.0	28.3	11.5	4.95	12.5	-1.30	56.1	2.5	5.91	9.23	35.8	-2.43	218.4	-17.2	10.23
51300.0	1999 MAY 1.5	1.01	220.1	0.0	37.7	14.9	4.95	13.4	-1.30	57.0	2.6	5.87	9.22	36.2	-2.43	218.7	-17.4	10.23
51310.0	1999 MAY 11.5	1.01	229.8	0.0	47.4	17.7	4.95	14.3	-1.30	57.9	2.6	5.80	9.22	36.5	-2.42	219.1	-17.5	10.21
51320.0	1999 MAY 21.5	1.01	239.5	0.0	57.3	20.0	4.95	15.2	-1.30	58.8	2.6	5.72	9.22	36.9	-2.42	219.4	-17.6	10.16
51330.0	1999 JUN 0.5	1.01	249.1	0.0	67.4	21.8	4.95	16.2	-1.30	59.7	2.6	5.62	9.22	37.2	-2.42	219.8	-17.7	10.09
51340.0	1999 JUN 10.5	1.02	258.6	0.0	77.7	23.0	4.95	17.1	-1.30	60.7	2.7	5.51	9.21	37.6	-2.41	220.1	-17.9	10.00
51350.0	1999 JUN 20.5	1.02	268.2	0.0	88.0	23.4	4.95	18.0	-1.29	61.6	2.7	5.38	9.21	37.9	-2.41	220.5	-18.0	9.89
51360.0	1999 JUL 0.5	1.02	277.7	0.0	98.4	23.2	4.95	18.9	-1.29	62.5	2.7	5.24	9.21	38.3	-2.41	220.8	-18.1	9.75
51370.0	1999 JUL 10.5	1.02	287.3	0.0	108.7	22.3	4.95	19.8	-1.29	63.4	2.7	5.10	9.21	38.7	-2.40	221.2	-18.2	9.62
51380.0	1999 JUL 20.5	1.02	296.8	0.0	118.9	20.8	4.95	20.7	-1.28	64.3	2.8	4.95	9.20	39.0	-2.40	221.6	-18.3	9.47
51390.0	1999 JUL 30.5	1.02	306.3	0.0	128.8	18.7	4.95	21.7	-1.28	65.2	2.8	4.80	9.20	39.4	-2.39	221.9	-18.5	9.31
51400.0	1999 AUG 9.5	1.01	315.9	0.0	138.4	16.1	4.95	22.6	-1.27	66.2	2.8	4.65	9.20	39.7	-2.39	222.3	-18.6	9.14
51410.0	1999 AUG 19.5	1.01	325.5	0.0	147.8	13.0	4.95	23.5	-1.27	67.1	2.8	4.50	9.20	40.1	-2.38	222.6	-18.7	8.98
51420.0	1999 AUG 29.5	1.01	335.2	0.0	157.0	9.5	4.95	24.4	-1.26	68.0	2.8	4.36	9.19	40.5	-2.38	223.0	-18.8	8.82
51430.0	1999 SEP 8.5	1.01	344.9	0.0	166.1	5.0	4.96	25.3	-1.26	68.9	2.9	4.24	9.19	40.8	-2.37	223.4	-18.9	8.67
51440.0	1999 SEP 18.5	1.00	354.6	0.0	175.0	2.1	4.96	26.2	-1.25	69.8	2.9	4.13	9.19	41.2	-2.37	223.7	-19.1	8.53
51450.0	1999 SEP 28.5	1.00	4.4	0.0	184.0	-1.7	4.96	27.2	-1.25	70.7	2.9	4.05	9.19	41.5	-2.36	224.1	-19.2	8.41
51460.0	1999 OCT 8.5	1.00	14.2	0.0	193.1	-5.5	4.96	28.1	-1.24	71.7	2.9	4.00	9.18	41.9	-2.36	224.4	-19.3	8.31
51470.0	1999 OCT 18.5	1.00	24.1	0.0	202.3	-9.4	4.96	29.0	-1.23	72.6	2.9	3.97	9.18	42.3	-2.36	224.8	-19.4	8.24
51480.0	1999 OCT 28.5	0.99	34.1	0.0	211.8	-12.9	4.96	29.9	-1.23	73.5	2.9	3.97	9.18	42.6	-2.35	225.2	-19.5	8.20
51490.0	1999 NOV 7.5	0.99	44.1	0.0	221.6	-16.1	4.96	30.8	-1.22	74.4	3.0	4.00	9.18	43.0	-2.34	225.5	-19.6	8.19
51500.0	1999 NOV 17.5	0.99	54.1	0.0	231.8	-18.8	4.96	31.7	-1.21	75.3	3.0	4.07	9.17	43.3	-2.34	225.9	-19.7	8.21
51510.0	1999 NOV 27.5	0.99	64.2	0.0	242.3	-21.0	4.96	32.6	-1.21	76.2	3.0	4.16	9.17	43.7	-2.33	226.3	-19.9	8.26
51520.0	1999 DEC 7.5	0.99	74.4	0.0	253.1	-22.5	4.96	33.5	-1.20	77.1	3.0	4.27	9.17	44.1	-2.33	226.6	-20.0	8.33
51530.0	1999 DEC 17.5	0.98	84.6	0.0	264.1	-23.3	4.97	34.5	-1.19	78.1	3.0	4.40	9.17	44.4	-2.32	227.0	-20.1	8.44
51540.0	1999 DEC 27.5	0.98	94.7	0.0	275.2	-23.4	4.97	35.4	-1.18	79.0	3.0	4.55	9.16	44.8	-2.32	227.4	-20.2	8.57

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	COIST	NEPTUNE R	LONG	LAT	RAS	DECS	COIST	PLUTO R	LONG	LAT	RAS	DECS	COIST
50700.0	1997 SEP 8.5	19.82	306.6	-0.62	186.5	39.2	19.04	30.13	298.3	0.40	291.0	-27.2	29.45	29.90	244.6	12.38	199.2	0.0	30.10
50710.0	1997 SEP 18.5	19.82	306.7	-0.62	186.4	39.0	19.17	30.13	298.4	0.40	291.0	-27.2	29.59	29.90	244.7	12.37	199.2	0.0	30.26
50720.0	1997 SEP 28.5	19.82	306.8	-0.62	186.4	38.9	19.31	30.13	298.4	0.40	291.1	-27.2	29.74	29.91	244.8	12.35	199.3	0.0	30.41
50730.0	1997 OCT 8.5	19.82	306.9	-0.62	186.4	38.8	19.47	30.13	298.5	0.39	291.2	-27.1	29.90	29.91	244.8	12.34	199.4	0.0	30.54
50740.0	1997 OCT 18.5	19.82	307.0	-0.62	186.4	38.7	19.63	30.13	298.6	0.39	291.2	-27.1	30.07	29.91	244.9	12.32	199.4	0.0	30.66
50750.0	1997 OCT 28.5	19.83	307.2	-0.62	186.3	38.6	19.81	30.13	298.6	0.39	291.3	-27.1	30.24	29.91	245.0	12.31	199.5	0.0	30.75
50760.0	1997 NOV 7.5	19.83	307.3	-0.62	186.3	38.5	19.98	30.12	298.7	0.39	291.3	-27.1	30.41	29.92	245.0	12.30	199.6	0.0	30.82
50770.0	1997 NOV 17.5	19.83	307.4	-0.62	186.3	38.4	20.14	30.12	298.7	0.39	291.4	-27.1	30.57	29.92	245.1	12.28	199.6	0.0	30.87
50780.0	1997 NOV 27.5	19.83	307.5	-0.62	186.3	38.3	20.30	30.12	298.8	0.39	291.5	-27.1	30.71	29.92	245.2	12.27	199.7	0.0	30.88
50790.0	1997 DEC 7.5	19.83	307.6	-0.62	186.3	38.2	20.44	30.12	298.9	0.38	291.5	-27.1	30.84	29.92	245.2	12.25	199.8	0.0	30.87
50800.0	1997 DEC 17.5	19.83	307.7	-0.62	186.2	38.1	20.57	30.12	298.9	0.38	291.6	-27.1	30.95	29.92	245.3	12.24	199.8	0.0	30.83
50810.0	1997 DEC 27.5	19.83	307.8	-0.63	186.2	38.0	20.67	30.12	299.0	0.38	291.7	-27.1	31.03	29.93	245.4	12.23	199.9	0.0	30.76
50820.0	1998 JAN 6.5	19.83	307.9	-0.63	186.2	37.9	20.75	30.12	299.0	0.38	291.7	-27.1	31.08	29.93	245.4	12.21	200.0	0.0	30.67
50830.0	1998 JAN 16.5	19.84	308.0	-0.63	186.2	37.8	20.80	30.12	299.1	0.38	291.8	-27.0	31.11	29.93	245.5	12.20	200.0	0.0	30.56
50840.0	1998 JAN 26.5	19.84	308.1	-0.63	186.1	37.6	20.82	30.12	299.2	0.37	291.9	-27.0	31.10	29.93	245.6	12.18	200.1	0.0	30.42
50850.0	1998 FEB 5.5	19.84	308.3	-0.63	186.1	37.5	20.82	30.12	299.2	0.37	291.9	-27.0	31.07	29.94	245.6	12.17	200.2	0.0	30.28
50860.0	1998 FEB 15.5	19.84	308.4	-0.63	186.1	37.4	20.78	30.12	299.3	0.37	292.0	-27.0	31.01	29.94	245.7	12.15	200.2	0.0	30.12
50870.0	1998 FEB 25.5	19.84	308.5	-0.63	186.1	37.3	20.72	30.12	299.3	0.37	292.1	-27.0	30.92	29.94	245.8	12.14	200.3	0.0	29.95
50880.0	1998 MAR 7.5	19.84	308.6	-0.63	186.0	37.2	20.64	30.12	299.4	0.37	292.1	-27.0	30.81	29.94	245.8	12.13	200.4	0.0	29.79
50890.0	1998 MAR 17.5	19.84	308.7	-0.63	186.0	37.1	20.53	30.12	299.5	0.37	292.2	-27.0	30.68	29.95	245.9	12.11	200.4	0.0	29.62
50900.0	1998 MAR 27.5	19.84	308.8	-0.63	186.0	37.0	20.40	30.12	299.5	0.36	292.3	-27.0	30.53	29.95	246.0	12.10	200.5	0.0	29.47
50910.0	1998 APR 6.5	19.85	308.9	-0.63	186.0	35.9	20.26	30.12	299.6	0.36	292.3	-27.0	30.37	29.95	246.0	12.08	200.6	0.0	29.33
50920.0	1998 APR 16.5	19.85	309.0	-0.63	185.9	36.8	20.10	30.12	299.6	0.36	292.4	-26.9	30.21	29.95	246.1	12.07	200.6	0.0	29.21
50930.0	1998 APR 26.5	19.85	309.1	-0.64	185.9	35.7	19.94	30.12	299.7	0.36	292.5	-26.9	30.03	29.96	246.2	12.06	200.7	0.0	29.11
50940.0	1998 MAY 6.5	19.85	309.2	-0.64	185.9	35.5	19.77	30.12	299.8	0.36	292.5	-26.9	29.87	29.96	246.2	12.04	200.8	0.0	29.04
50950.0	1998 MAY 16.5	19.85	309.3	-0.64	185.9	36.5	19.60	30.12	299.8	0.35	292.6	-26.9	29.71	29.96	246.3	12.03	200.8	0.0	28.99
50960.0	1998 MAY 26.5	19.85	309.5	-0.64	185.8	35.3	19.44	30.12	299.9	0.35	292.7	-26.9	29.56	29.96	246.4	12.01	200.9	0.0	28.97
50970.0	1998 JUN 5.5	19.85	309.6	-0.64	185.8	36.2	19.30	30.12	299.9	0.35	292.7	-26.9	29.42	29.97	246.4	12.00	201.0	0.0	28.98
50980.0	1998 JUN 15.5	19.85	309.7	-0.64	185.8	35.1	19.16	30.12	300.0	0.35	292.8	-26.9	29.31	29.97	246.5	11.98	201.0	0.0	29.02
50990.0	1998 JUN 25.5	19.85	309.8	-0.64	185.8	35.0	19.05	30.12	300.1	0.35	292.9	-26.9	29.22	29.97	246.6	11.97	201.1	0.0	29.09
51000.0	1998 JUL 5.5	19.86	309.9	-0.64	185.8	35.9	18.96	30.12	300.1	0.35	292.9	-26.9	29.15	29.97	246.6	11.95	201.2	0.0	29.18
51010.0	1998 JUL 15.5	19.86	310.0	-0.64	185.7	35.8	18.89	30.12	300.2	0.34	293.0	-26.8	29.11	29.98	246.7	11.94	201.2	0.0	29.29
51020.0	1998 JUL 25.5	19.86	310.1	-0.64	185.7	35.7	18.85	30.12	300.2	0.34	293.1	-26.8	29.10	29.98	246.8	11.93	201.3	0.0	29.42
51030.0	1998 AUG 4.5	19.86	310.2	-0.64	185.7	35.6	18.85	30.12	300.3	0.34	293.1	-26.8	29.12	29.98	246.8	11.91	201.4	0.0	29.57
51040.0	1998 AUG 14.5	19.86	310.3	-0.64	185.7	35.5	18.87	30.12	300.4	0.34	293.2	-26.8	29.17	29.98	246.9	11.90	201.4	0.0	29.73
51050.0	1998 AUG 24.5	19.86	310.4	-0.65	185.6	35.4	18.92	30.12	300.4	0.34	293.3	-26.8	29.25	29.99	247.0	11.88	201.5	0.0	29.89
51060.0	1998 SEP 3.5	19.86	310.6	-0.65	185.6	35.3	18.99	30.12	300.5	0.33	293.3	-26.8	29.35	29.99	247.0	11.87	201.6	0.0	30.06
51070.0	1998 SEP 13.5	19.86	310.7	-0.65	185.6	35.2	19.10	30.12	300.5	0.33	293.4	-26.8	29.47	29.99	247.1	11.85	201.6	0.0	30.23
51080.0	1998 SEP 23.5	19.87	310.8	-0.65	185.6	35.1	19.22	30.12	300.6	0.33	293.5	-26.8	29.61	29.99	247.2	11.84	201.7	0.0	30.39
51090.0	1998 OCT 3.5	19.87	310.9	-0.65	185.6	34.9	19.37	30.12	300.7	0.33	293.5	-26.8	29.77	30.00	247.2	11.83	201.8	0.0	30.53
51100.0	1998 OCT 13.5	19.87	311.0	-0.65	185.5	34.8	19.52	30.12	300.7	0.33	293.6	-26.7	29.94	30.00	247.3	11.81	201.8	0.0	30.66
51110.0	1998 OCT 23.5	19.87	311.1	-0.65	185.5	34.7	19.69	30.12	300.8	0.33	293.6	-26.7	30.11	30.00	247.4	11.80	201.9	0.0	30.78
51120.0	1998 NOV 2.5	19.87	311.2	-0.65	185.5	34.6	19.86	30.12	300.8	0.32	293.7	-26.7	30.28	30.01	247.4	11.78	202.0	0.0	30.87
51130.0	1998 NOV 12.5	19.87	311.3	-0.65	185.5	34.5	20.03	30.12	300.9	0.32	293.8	-26.7	30.44	30.01	247.5	11.77	202.0	0.0	30.93
51140.0	1998 NOV 22.5	19.87	311.4	-0.65	185.4	34.4	20.20	30.11	300.9	0.32	293.8	-26.7	30.60	30.01	247.6	11.75	202.1	0.0	30.97
51150.0	1998 DEC 2.5	19.87	311.5	-0.65	185.4	34.3	20.36	30.11	301.0	0.32	293.9	-26.7	30.74	30.01	247.6	11.74	202.2	0.0	30.98
51160.0	1998 DEC 12.5	19.87	311.6	-0.65	185.4	34.2	20.50	30.11	301.1	0.32	294.0	-26.7	30.86	30.02	247.7	11.72	202.2	0.0	30.96
51170.0	1998 DEC 22.5	19.88	311.8	-0.66	185.4	34.1	20.62	30.11	301.1	0.31	294.0	-26.7	30.96	30.02	247.8	11.71	202.3	0.0	30.91
51180.0	1999 JAN 1.5	19.88	311.9	-0.66	185.4	34.0	20.72	30.11	301.2	0.31	294.1	-26.6	31.03	30.02	247.8	11.69	202.4	0.0	30.84
51190.0	1999 JAN 11.5	19.88	312.0	-0.66	185.3	33.9	20.80	30.11	301.2	0.31	294.2	-26.6	31.08	30.02	247.9	11.68	202.4	0.0	30.74
51200.0	1999 JAN 21.5	19.88	312.1	-0.66	185.3	33.8	20.84	30.11	301.3	0.31	294.2	-26.6	31.10	30.03	248.0	11.67	202.5	0.0	30.62
51210.0	1999 FEB 0.5	19.88	312.2	-0.66	185.3	33.7	20.87	30.11	301.4	0.31	294.3	-26.6	31.09	30.03	248.0	11.65	202.6	0.0	30.49
51220.0	1999 FEB 10.5	19.88	312.3	-0.66	185.3	33.5	20.86	30.11	301.4	0.31	294.4	-26.6	31.05	30.03	248.1	11.64	202.6	0.0	30.33
51230.0	1999 FEB 20.5	19.88	312.4	-0.66	185.2	33.4	20.82	30.11	301.5	0.30	294.4	-26.6	30.98	30.04	248.2	11.62	202.7	0.0	30.17
51240.0	1999 MAR 2.5	19.88	312.5	-0.66	185.2	33.3	20.76	30.11	301.5	0.30	294.5	-26.6	30.88	30.04	248.2	11.61	202.8	0.0	30.01
51250.0	1999 MAR 12.5	19.89	312.6	-0.66	185.2	33.2	20.67	30.11	301.6	0.30	294.6	-26.6	30.77	30.04	248.3	11.59	202.8	0.0	29.84
51260.0	1999 MAR 22.5	19.89	312.7	-0.66	185.2	33.1	20.55	30.11	301.7	0.30	294.6	-26.6	30.63	30.04	248.4	11.58	202.9	0.0	29.68
51270.0	1999 APR 1.5	19.89	312.8	-0.66	185.2	33.0	20.44	30.11	301.7	0.30	294.7	-26.5	30.48	30.05	248.4	11.56	203.0	0.0	29.53
51280.0	1999 APR 11.5	19.89	313.0	-0.66	185.1	32.9	20.29	30.11	301.8	0.29	294.8	-26.5	30.32	30.05	248.5	11.55	203.0	0.0	29.40
51290.0	1999 APR 21.5	19.89	313.1	-0.66	185.1	32.8	20.13	30.11	301.8	0.29	294.8	-26.5	30.15	30.05	248.6	11.53	203.1	0.0	29.28
51300.0	1999 MAY 1.5	19.89	313.2	-0.67	185.1	32.7	19.97	30.11	301.9	0.29	294.9	-26.5	29.98	30.05	248.6	11.52	203.2	0.0	29.19
51310.0	1999 MAY 11.5	19.89	313.3	-0.67	185.1	32.6	19.80	30.11	302.0	0.29	295.0	-26.5	29.82	30.06	248.7	11.50	203.2	0.0	29.12
51320.0	1999 MAY 21.5	19.89	313.4	-0.67	185.1	32.5	19.64	30.11	302.0	0.29	295.0	-26.5	29.66	30.06	248.7	11.49	203.3	0.0	29.08
51330.0	1999 JUN 0.5	19.89	313.5	-0.67	185.0	32.4	19.48	30.11	302.1	0.29	295.1	-26.5	29.51	30.06	248.8	11.47	203.4	0.0	29.07
51340.0	1999 JUN 10.5	19.90	313.6	-0.67	185.0	32.3	19.33	30.11	302.1	0.28	295.1	-26.5	29.38	30.07	248.9	11.46	203.4	0.0	29.09
51350.0	1999 JUN 20.5	19.90	313.7	-0.67	185.0	32.1	19.20	30.11	302.2	0.28	295.2	-26.4	29.27	30.07	248.9	11.45	203.5	0.0	29.13
51360.0	1999 JUL 0.5	19.90	313.8	-0.67	185.0	32.0	19.09	30.11	302.3	0.28	295.3	-26.4	29.19	30.07	249.0	11.43	203.6	0.0	29.20
51370.0	1999 JUL 10.5	19.90	313.9	-0.67	185.0	31.9	19.00	30.11	302.3	0.28	295.3	-26.4	29.13	30.07	249.1	11.42	203.6	0.0	29.30
51380.0	1999 JUL 20.5	19.90	314.0	-0.67	184.9	31.8	18.93	30.11	302.4	0.28	295.4	-26.4	29.10	30.08	249.1	11.40	203.7	0.0	29.42
51390.0	1999 JUL 30.5	19.90	314.2	-0.67	184.9	31.7	18.90	30.11	302.4	0.27	295.5	-26.4	29.10	30.08	249.2	11.39	203.8	0.0	29.55
51400.0	1999 AUG 9.5	19.90	314.3	-0.67	184.9	31.6	18.89	30.11	302.5	0.27	295.5	-26.4	29.12	30.08	249.3	11.37	203.8	0.0	29.70
51410.0	1999 AUG 19.5	19.90	314.4	-0.67	184.8	31.5	18.91	30.11	302.6	0.27	295.6	-26.4	29.18	30.09	249.3	11.36	203.9	0.0	29.86
51420.0	1999 AUG 29.5	19.90	314.5	-0.67	184.8	31.4	18.96	30.11	302.6	0.27	295.7	-26.4	29.26	30.09	249.4	11.34	204.0	0.0	30.03
51430.0	1999 SEP 8.5	19.90	314.6	-0.67	184.8	31.3	19.04	30.11	302.7	0.27	295.7	-26.3	29.37	30.09	249.5	11.33	204.0	0.0	30.20
51440.0	1999 SEP 18.5	19.91	314.7	-0.68	184.8	31.2	19.15	30.11	302.7	0.27	295.8	-26.3	29.50	30.09	249.5	11.31	204.1	0.0	30.37
51450.0	1999 SEP 28.5	19.91	314.8	-0.68	184.8	31.1	19.27	30.11	302.8	0.26	295.9	-26.3	29.64	30.10	249.6	11.30	204.2	0.0	30.52
51460.0	1999 OCT 8.5	19.91	314.9	-0.68	184.8	31.0	19.42	30.11	302.9	0.26	295.9	-26.3	29.80	30.10	249.7	11.28	204.2	0.0	30.67
51470.0	1999 OCT 18.5	19.91	315.0	-0.68	184.7	30.9	19.58	30.11	302.9	0.26	296.0	-26.3	29.97	30.10	249.7	11.27	204.3	0.0	30.79
51480.0	1999 OCT 28.5	19.91	315.1	-0.68	184.7	30.8	19.74	30.11	303.0	0.26	296.1	-26.3	30.14	30.11	249.8	11.25	204.4	0.0	30.90
51490.0	1999 NOV 7.5	19.91	315.2	-0.68	184.7	30.6	19.92	30.11	303.0	0.26	296.1	-26.3	30.31	30.11	249.9	11.24	204.4	0.0	30.99
51500.0	1999 NOV 17.5	19.91	315.3	-0.68	184.7	30.5	20.09	30.11	303.1	0.25	296.2	-26.3	30.47	30.11	249.9	11.22	204.5	0.0	31.05
51510.0	1999 NOV 27.5	19.91	315.5	-0.68	184.7	30.4	20.25	30.11	303.2	0.25	296.3	-26.2	30.63	30.11	250.0	11.21	204.5	0.0	31.08
51520.0	1999 DEC 7.5	19.91	315.6	-0.68	184.6	30.3	20.41	30.11	303.2	0.25	296.3	-26.2	30.76	30.12	250.1	11.19	204.6	0.0	31.08
51530.0	1999 DEC 17.5	19.92	315.7	-0.68	184.6	30.2	20.55	30.10	303.3	0.25	296.4	-26.2	30.88	30.12	250.1	11.18	204.7	0.0	31.06
51540.0	1999 DEC 27.5	19.92	315.8	-0.68	184.6	30.1	20.67	30.10	303.3	0.25	296.4	-26.2	30.97	30.12	250.2	11.16	204.7	0.0	31.00

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	EARTH R	EARTH LONG	EARTH LAT	EARTH RAS	EARTH DECS	JUPITER R	JUPITER LONG	JUPITER LAT	JUPITER RAS	JUPITER DECS	JUPITER CDIST	SATURN R	SATURN LONG	SATURN LAT	SATURN RAS	SATURN DECS	SATURN CDIST
51550.0	2000 JAN 6.5	0.98	104.9	0.0	286.2	-22.5	4.97	36.3	-1.17	79.9	3.0	4.70	9.16	45.2	-2.31	227.7	-20.3	8.71
51560.0	2000 JAN 16.5	0.98	115.1	0.0	297.1	-21.1	4.97	37.2	-1.16	80.8	3.0	4.86	9.16	45.5	-2.31	228.1	-20.4	8.87
51570.0	2000 JAN 26.5	0.98	125.3	0.0	307.7	-18.9	4.97	38.1	-1.15	81.7	3.0	5.02	9.16	45.9	-2.30	228.5	-20.5	9.03
51580.0	2000 FEB 5.5	0.99	135.4	0.0	317.9	-16.2	4.97	39.0	-1.14	82.6	3.0	5.18	9.16	46.2	-2.29	228.8	-20.6	9.19
51590.0	2000 FEB 15.5	0.99	145.6	0.0	327.8	-13.0	4.97	39.9	-1.13	83.5	3.0	5.33	9.15	46.6	-2.29	229.2	-20.7	9.36
51600.0	2000 FEB 25.5	0.99	155.6	0.0	337.5	-9.4	4.98	40.8	-1.12	84.4	3.1	5.47	9.15	47.0	-2.28	229.6	-20.8	9.51
51610.0	2000 MAR 6.5	0.99	165.7	0.0	346.8	-5.5	4.98	41.7	-1.11	85.3	3.1	5.59	9.15	47.3	-2.27	229.9	-20.9	9.65
51620.0	2000 MAR 16.5	0.99	175.7	0.0	356.0	-1.7	4.98	42.6	-1.10	86.2	3.1	5.70	9.15	47.7	-2.27	230.3	-21.0	9.79
51630.0	2000 MAR 26.5	1.00	185.6	0.0	5.1	2.2	4.98	43.5	-1.09	87.2	3.1	5.80	9.14	48.1	-2.26	230.7	-21.1	9.90
51640.0	2000 APR 5.5	1.00	195.5	0.0	14.3	6.1	4.98	44.4	-1.08	88.1	3.1	5.88	9.14	48.4	-2.25	231.1	-21.2	10.00
51650.0	2000 APR 15.5	1.00	205.3	0.0	23.4	9.8	4.99	45.4	-1.07	89.0	3.1	5.94	9.14	48.8	-2.25	231.4	-21.3	10.07
51660.0	2000 APR 25.5	1.01	215.0	0.0	32.8	13.2	4.99	46.3	-1.05	89.9	3.1	5.98	9.14	49.2	-2.24	231.8	-21.4	10.12
51670.0	2000 MAY 5.5	1.01	224.7	0.0	42.3	16.3	4.99	47.2	-1.04	90.8	3.1	6.00	9.14	49.5	-2.23	232.2	-21.5	10.14
51680.0	2000 MAY 15.5	1.01	234.4	0.0	52.1	18.9	4.99	48.1	-1.03	91.7	3.1	6.00	9.13	49.9	-2.23	232.6	-21.6	10.14
51690.0	2000 MAY 25.5	1.01	244.0	0.0	62.0	21.0	4.99	49.0	-1.02	92.6	3.1	5.98	9.13	50.2	-2.22	232.9	-21.7	10.12
51700.0	2000 JUN 4.5	1.01	253.6	0.0	72.2	22.4	5.00	49.9	-1.00	93.5	3.1	5.94	9.13	50.6	-2.21	233.3	-21.8	10.07
51710.0	2000 JUN 14.5	1.02	263.2	0.0	82.6	23.3	5.00	50.8	-0.99	94.4	3.1	5.88	9.13	51.0	-2.21	233.7	-21.9	10.00
51720.0	2000 JUN 24.5	1.02	272.7	0.0	93.0	23.4	5.00	51.7	-0.98	95.3	3.1	5.80	9.13	51.3	-2.20	234.1	-22.0	9.91
51730.0	2000 JUL 4.5	1.02	282.2	0.0	103.3	22.9	5.00	52.6	-0.96	96.2	3.0	5.71	9.12	51.7	-2.19	234.5	-22.1	9.80
51740.0	2000 JUL 14.5	1.02	291.8	0.0	113.6	21.7	5.00	53.5	-0.95	97.1	3.0	5.61	9.12	52.1	-2.18	234.8	-22.2	9.67
51750.0	2000 JUL 24.5	1.02	301.3	0.0	123.6	19.9	5.01	54.4	-0.93	98.0	3.0	5.48	9.12	52.4	-2.18	235.2	-22.3	9.53
51760.0	2000 AUG 3.5	1.01	310.9	0.0	133.4	17.5	5.01	55.3	-0.92	98.9	3.0	5.35	9.12	52.8	-2.17	235.6	-22.4	9.38
51770.0	2000 AUG 13.5	1.01	320.5	0.0	142.9	14.7	5.01	56.1	-0.91	99.8	3.0	5.21	9.12	53.2	-2.16	236.0	-22.5	9.22
51780.0	2000 AUG 23.5	1.01	330.1	0.0	152.2	11.4	5.01	57.0	-0.89	100.7	3.0	5.06	9.11	53.5	-2.15	236.4	-22.6	9.05
51790.0	2000 SEP 2.5	1.01	339.8	0.0	161.3	7.9	5.02	57.9	-0.88	101.6	3.0	4.91	9.11	53.9	-2.14	236.8	-22.7	8.89
51800.0	2000 SEP 12.5	1.01	349.5	0.0	170.3	4.2	5.02	58.8	-0.86	102.5	3.0	4.76	9.11	54.3	-2.14	237.1	-22.8	8.73
51810.0	2000 SEP 22.5	1.00	359.2	0.0	179.3	0.3	5.02	59.7	-0.84	103.3	3.0	4.61	9.11	54.6	-2.13	237.5	-22.9	8.58
51820.0	2000 OCT 2.5	1.00	9.0	0.0	188.3	-3.6	5.02	60.6	-0.83	104.2	3.0	4.47	9.11	55.0	-2.12	237.9	-23.0	8.44
51830.0	2000 OCT 12.5	1.00	18.9	0.0	197.5	-7.4	5.03	61.5	-0.81	105.1	3.0	4.35	9.10	55.4	-2.11	238.3	-23.0	8.32
51840.0	2000 OCT 22.5	0.99	28.8	0.0	206.8	-11.1	5.03	62.4	-0.80	106.0	2.9	4.24	9.10	55.7	-2.10	238.7	-23.1	8.23
51850.0	2000 NOV 1.5	0.99	38.8	0.0	216.4	-14.5	5.03	63.3	-0.78	106.9	2.9	4.15	9.10	56.1	-2.09	239.1	-23.2	8.16
51860.0	2000 NOV 11.5	0.99	48.8	0.0	226.4	-17.4	5.04	64.2	-0.77	107.8	2.9	4.09	9.10	56.5	-2.08	239.5	-23.3	8.12
51870.0	2000 NOV 21.5	0.99	58.9	0.0	236.7	-19.9	5.04	65.0	-0.75	108.7	2.9	4.06	9.10	56.8	-2.08	239.9	-23.4	8.11
51880.0	2000 DEC 1.5	0.99	69.1	0.0	247.4	-21.8	5.04	65.9	-0.73	109.6	2.9	4.06	9.09	57.2	-2.07	240.2	-23.5	8.13
51890.0	2000 DEC 11.5	0.98	79.2	0.0	258.3	-23.0	5.04	66.8	-0.72	110.5	2.9	4.09	9.09	57.6	-2.06	240.6	-23.5	8.19
51900.0	2000 DEC 21.5	0.98	89.4	0.0	269.3	-23.4	5.05	67.7	-0.70	111.3	2.9	4.15	9.09	57.9	-2.05	241.0	-23.6	8.27
51910.0	2001 JAN 0.5	0.98	99.6	0.0	280.4	-23.1	5.05	68.6	-0.68	112.2	2.8	4.24	9.09	58.3	-2.04	241.4	-23.7	8.39
51920.0	2001 JAN 10.5	0.98	109.8	0.0	291.4	-22.0	5.05	69.5	-0.66	113.1	2.8	4.35	9.09	58.7	-2.03	241.8	-23.8	8.50
51930.0	2001 JAN 20.5	0.98	119.9	0.0	302.1	-20.2	5.06	70.3	-0.65	114.0	2.8	4.48	9.09	59.0	-2.02	242.2	-23.9	8.65
51940.0	2001 JAN 30.5	0.99	130.1	0.0	312.6	-17.7	5.05	71.2	-0.63	114.9	2.8	4.63	9.08	59.4	-2.01	242.6	-23.9	8.81
51950.0	2001 FEB 9.5	0.99	140.2	0.0	322.7	-14.7	5.06	72.1	-0.61	115.7	2.8	4.78	9.08	59.8	-2.00	243.0	-24.0	8.97
51960.0	2001 FEB 19.5	0.99	150.4	0.0	332.4	-11.3	5.07	73.0	-0.59	116.6	2.7	4.94	9.08	60.2	-1.99	243.4	-24.1	9.14
51970.0	2001 MAR 1.5	0.99	160.4	0.0	341.9	-7.7	5.07	73.8	-0.58	117.5	2.7	5.11	9.08	60.5	-1.98	243.8	-24.2	9.30
51980.0	2001 MAR 11.5	0.99	170.4	0.0	351.2	-3.8	5.07	74.7	-0.56	118.4	2.7	5.26	9.08	60.9	-1.97	244.2	-24.2	9.46
51990.0	2001 MAR 21.5	1.00	180.4	0.0	0.4	0.2	5.07	75.6	-0.54	119.2	2.7	5.42	9.08	61.3	-1.96	244.6	-24.3	9.60
52000.0	2001 APR 0.5	1.00	190.3	0.0	9.5	4.1	5.08	76.5	-0.52	120.1	2.7	5.56	9.07	61.6	-1.95	245.0	-24.4	9.73
52010.0	2001 APR 10.5	1.00	200.1	0.0	18.6	7.9	5.08	77.3	-0.50	121.0	2.6	5.69	9.07	62.0	-1.94	245.4	-24.4	9.84
52020.0	2001 APR 20.5	1.00	209.9	0.0	27.8	11.5	5.08	78.2	-0.49	121.9	2.6	5.80	9.07	62.4	-1.93	245.8	-24.5	9.93
52030.0	2001 MAY 0.5	1.01	219.6	0.0	37.3	14.7	5.09	79.1	-0.47	122.7	2.6	5.90	9.07	62.7	-1.92	246.2	-24.6	10.00
52040.0	2001 MAY 10.5	1.01	229.3	0.0	46.9	17.5	5.09	79.9	-0.45	123.6	2.6	5.98	9.07	63.1	-1.91	246.6	-24.6	10.05
52050.0	2001 MAY 20.5	1.01	239.0	0.0	56.8	19.9	5.09	80.8	-0.43	124.5	2.5	6.05	9.07	63.5	-1.90	247.0	-24.7	10.08
52060.0	2001 MAY 30.5	1.01	248.6	0.0	66.9	21.7	5.10	81.7	-0.41	125.3	2.5	6.09	9.07	63.8	-1.89	247.4	-24.8	10.08
52070.0	2001 JUN 9.5	1.02	258.1	0.0	77.1	22.9	5.10	82.5	-0.39	126.2	2.5	6.11	9.06	64.2	-1.88	247.8	-24.8	10.05
52080.0	2001 JUN 19.5	1.02	267.7	0.0	87.5	23.4	5.10	83.4	-0.37	127.0	2.4	6.12	9.06	64.6	-1.87	248.2	-24.9	10.00
52090.0	2001 JUN 29.5	1.02	277.2	0.0	97.9	23.3	5.11	84.3	-0.36	127.9	2.4	6.10	9.06	65.0	-1.86	248.6	-25.0	9.94
52100.0	2001 JUL 9.5	1.02	286.8	0.0	108.2	22.4	5.11	85.1	-0.34	128.8	2.4	6.07	9.06	65.3	-1.85	249.0	-25.0	9.84
52110.0	2001 JUL 19.5	1.02	296.3	0.0	118.3	20.9	5.12	86.0	-0.32	129.6	2.4	6.01	9.06	65.7	-1.84	249.4	-25.1	9.73
52120.0	2001 JUL 29.5	1.02	305.9	0.0	128.3	18.8	5.12	86.8	-0.30	130.5	2.3	5.94	9.06	66.1	-1.83	249.8	-25.1	9.61
52130.0	2001 AUG 8.5	1.01	315.4	0.0	137.9	16.2	5.12	87.7	-0.28	131.3	2.3	5.85	9.06	66.4	-1.82	250.2	-25.2	9.47
52140.0	2001 AUG 18.5	1.01	325.0	0.0	147.3	13.2	5.13	88.5	-0.26	132.2	2.3	5.75	9.05	66.8	-1.81	250.6	-25.2	9.31
52150.0	2001 AUG 28.5	1.01	334.7	0.0	156.5	9.8	5.13	89.4	-0.24	133.1	2.2	5.63	9.05	67.2	-1.80	251.0	-25.3	9.15
52160.0	2001 SEP 7.5	1.01	344.4	0.0	165.6	6.2	5.13	90.2	-0.22	133.9	2.2	5.49	9.05	67.5	-1.78	251.4	-25.3	8.99
52170.0	2001 SEP 17.5	1.00	354.1	0.0	174.6	2.3	5.14	91.1	-0.20	134.8	2.2	5.35	9.05	67.9	-1.77	251.8	-25.4	8.82
52180.0	2001 SEP 27.5	1.00	3.9	0.0	183.6	-1.5	5.14	92.0	-0.18	135.6	2.1	5.20	9.05	68.3	-1.76	252.2	-25.5	8.66
52190.0	2001 OCT 7.5	1.00	13.7	0.0	192.4	-5.4	5.14	92.8	-0.16	136.5	2.1	5.05	9.05	68.7	-1.75	252.6	-25.5	8.51
52200.0	2001 OCT 17.5	1.00	23.6	0.0	201.9	-9.2	5.15	93.6	-0.15	137.3	2.1	4.90	9.05	69.0	-1.74	253.0	-25.6	8.38
52210.0	2001 OCT 27.5	0.99	33.6	0.0	211.3	-12.7	5.15	94.5	-0.13	138.2	2.0	4.75	9.05	69.4	-1.73	253.5	-25.6	8.26
52220.0	2001 NOV 6.5	0.99	43.6	0.0	221.1	-15.9	5.15	95.3	-0.11	139.0	2.0	4.61	9.04	69.8	-1.72	253.9	-25.6	8.17
52230.0	2001 NOV 16.5	0.99	53.6	0.0	231.3	-18.7	5.16	96.2	-0.09	139.8	2.0	4.48	9.04	70.1	-1.70	254.3	-25.7	8.10
52240.0	2001 NOV 26.5	0.99	63.7	0.0	241.7	-20.9	5.16	97.0	-0.07	140.7	1.9	4.37	9.04	70.5	-1.69	254.7	-25.7	8.06
52250.0	2001 DEC 6.5	0.99	73.9	0.0	252.5	-22.5	5.17	97.9	-0.05	141.5	1.9	4.28	9.04	70.9	-1.68	255.1	-25.8	8.06
52260.0	2001 DEC 16.5	0.98	84.0	0.0	263.5	-23.3	5.17	98.7	-0.03	142.4	1.9	4.22	9.04	71.3	-1.67	255.5	-25.8	8.08
52270.0	2001 DEC 26.5	0.98	94.2	0.0	274.6	-23.4	5.17	99.6	-0.01	143.2	1.8	4.19	9.04	71.6	-1.66	255.9	-25.9	8.14
52280.0	2002 JAN 5.5	0.98	104.4	0.0	285.7	-22.7	5.18	100.4	0.01	144.1	1.8	4.20	9.04	72.0	-1.64	256.3	-25.9	8.22
52290.0	2002 JAN 15.5	0.98	114.6	0.0	296.5	-21.2	5.18	101.2	0.03	144.9	1.8	4.23	9.04	72.4	-1.63	256.7	-25.9	8.33
52300.0	2002 JAN 25.5	0.98	124.8	0.0	307.1	-19.1	5.18	102.1	0.05	145.7	1.7	4.29	9.04	72.8	-1.62	257.1	-26.0	8.47
52310.0	2002 FEB 4.5	0.99	134.9	0.0	317.4	-16.4	5.19	102.9	0.07	146.6	1.7	4.38	9.03	73.1	-1.61	257.6	-26.0	8.61
52320.0	2002 FEB 14.5	0.99	145.0	0.0	327.3	-13.2	5.19	103.7	0.08	147.4	1.7	4.50	9.03	73.5	-1.59	258.0	-26.1	8.77
52330.0	2002 FEB 24.5	0.99	155.1	0.0	337.0	-9.5	5.19	104.6	0.10	148.2	1.6	4.63	9.03	73.9	-1.58	258.4	-26.1	8.94
52340.0	2002 MAR 6.5	0.99	165.2	0.0	346.4	-5.8	5.20	105.4	0.12	149.1	1.6	4.78	9.03	74.2	-1.57	258.8	-26.1	9.10
52350.0	2002 MAR 16.5	0.99	175.1	0.0	355.6	-1.9	5.20	106.2	0.14	149.9	1.5	4.93	9.03	74.6	-1.56	259.2	-26.1	9.26
52360.0	2002 MAR 26.5	1.00	185.1	0.0	4.7	2.0	5.21	107.1	0.16	150.7	1.5	5.09	9.03	75.0	-1.54	259.6	-26.2	9.42
52370.0	2002 APR 5.5	1.00	195.0	0.0	13.8	5.9	5.21	107.9	0.18	151.5	1.5	5.25	9.03	75.4	-1.53	260.0	-26.2	9.56
52380.0	2002 APR 15.5	1.00	204.8	0.0	23.0	9.4	5.21	108.7	0.20	152.4	1.4	5.41	9.03	75.7	-1.52	260.5	-26.2	9.69
52390.0	2002 APR 25.5	1.01	214.5	0.0	32.3	13.0	5.22	109.5	0.22	153.2	1.4	5.56	9.03	76.1	-1.51	260.9	-26.3	9.80

PLANETARY EPHEMERIS
HELIOCENTRIC ECLIPTIC COORDINATES

	DATE	URANUS R	LONG	LAT	RAS	DECS	CDIST	NEPTUNE R	LONG	LAT	RAS	DECS	CDIST	PLUTO R	LONG	LAT	RAS	DECS	CDIST
51550.0	2000 JAN 6.5	19.92	315.9	-0.68	184.6	30.0	20.77	30.10	303.4	0.25	296.5	-26.2	31.04	30.13	250.3	11.15	204.8	0.0	30.93
51560.0	2000 JAN 16.5	19.92	316.0	-0.68	184.6	29.9	20.84	30.10	303.5	0.24	296.6	-26.2	31.08	30.13	250.3	11.13	204.9	0.0	30.82
51570.0	2000 JAN 26.5	19.92	316.1	-0.68	184.5	29.8	20.89	30.10	303.5	0.24	296.6	-26.2	31.09	30.13	250.4	11.12	204.9	0.0	30.70
51580.0	2000 FEB 5.5	19.92	316.2	-0.69	184.5	29.7	20.91	30.10	303.6	0.24	296.7	-26.2	31.07	30.14	250.5	11.10	205.0	0.0	30.56
51590.0	2000 FEB 15.5	19.92	316.3	-0.69	184.5	29.5	20.90	30.10	303.6	0.24	296.8	-26.1	31.02	30.14	250.5	11.09	205.1	0.0	30.40
51600.0	2000 FEB 25.5	19.92	316.4	-0.69	184.5	29.5	20.86	30.10	303.7	0.24	296.8	-26.1	30.95	30.14	250.6	11.07	205.1	0.0	30.24
51610.0	2000 MAR 6.5	19.92	316.5	-0.69	184.5	29.4	20.80	30.10	303.7	0.23	296.9	-26.1	30.85	30.14	250.7	11.06	205.2	0.0	30.08
51620.0	2000 MAR 16.5	19.92	316.7	-0.69	184.4	29.3	20.71	30.10	303.8	0.23	297.0	-26.1	30.73	30.15	250.7	11.04	205.3	0.0	29.91
51630.0	2000 MAR 26.5	19.93	316.8	-0.69	184.4	29.1	20.60	30.10	303.9	0.23	297.0	-26.1	30.59	30.15	250.8	11.03	205.3	0.0	29.75
51640.0	2000 APR 5.5	19.93	316.9	-0.69	184.4	29.0	20.47	30.10	303.9	0.23	297.1	-26.1	30.43	30.15	250.9	11.01	205.4	0.0	29.61
51650.0	2000 APR 15.5	19.93	317.0	-0.69	184.4	28.9	20.32	30.10	304.0	0.23	297.2	-26.1	30.27	30.16	250.9	11.00	205.5	0.0	29.48
51660.0	2000 APR 25.5	19.93	317.1	-0.69	184.4	28.8	20.15	30.10	304.0	0.23	297.2	-26.1	30.10	30.16	251.0	10.98	205.5	0.0	29.37
51670.0	2000 MAY 5.5	19.93	317.2	-0.69	184.3	28.7	20.00	30.10	304.1	0.22	297.3	-26.0	29.93	30.16	251.0	10.97	205.6	0.0	29.28
51680.0	2000 MAY 15.5	19.93	317.3	-0.69	184.3	28.6	19.83	30.10	304.2	0.22	297.4	-26.0	29.77	30.17	251.1	10.95	205.7	0.0	29.22
51690.0	2000 MAY 25.5	19.93	317.4	-0.69	184.3	28.5	19.67	30.10	304.2	0.22	297.4	-26.0	29.61	30.17	251.2	10.94	205.7	0.0	29.18
51700.0	2000 JUN 4.5	19.93	317.5	-0.69	184.3	28.4	19.51	30.10	304.3	0.22	297.5	-26.0	29.47	30.17	251.2	10.92	205.8	0.0	29.18
51710.0	2000 JUN 14.5	19.93	317.6	-0.69	184.3	28.3	19.36	30.10	304.3	0.22	297.6	-26.0	29.34	30.17	251.3	10.91	205.9	0.0	29.20
51720.0	2000 JUN 24.5	19.93	317.7	-0.69	184.3	28.2	19.23	30.10	304.4	0.21	297.6	-26.0	29.24	30.18	251.4	10.89	205.9	0.0	29.25
51730.0	2000 JUL 4.5	19.94	317.8	-0.70	184.2	28.1	19.12	30.10	304.5	0.21	297.7	-26.0	29.16	30.18	251.4	10.88	206.0	0.0	29.33
51740.0	2000 JUL 14.5	19.94	318.0	-0.70	184.2	28.0	19.03	30.10	304.5	0.21	297.7	-25.9	29.11	30.18	251.5	10.86	206.1	0.0	29.43
51750.0	2000 JUL 24.5	19.94	318.1	-0.70	184.2	27.9	18.97	30.10	304.6	0.21	297.8	-25.9	29.08	30.19	251.6	10.84	206.1	0.0	29.55
51760.0	2000 AUG 3.5	19.94	318.2	-0.70	184.2	27.7	18.93	30.10	304.6	0.21	297.9	-25.9	29.09	30.19	251.6	10.83	206.2	0.0	29.69
51770.0	2000 AUG 13.5	19.94	318.3	-0.70	184.2	27.6	18.93	30.10	304.7	0.21	297.9	-25.9	29.12	30.19	251.7	10.81	206.3	0.0	29.85
51780.0	2000 AUG 23.5	19.94	318.4	-0.70	184.1	27.5	18.95	30.10	304.8	0.20	298.0	-25.9	29.19	30.20	251.8	10.80	206.3	0.0	30.01
51790.0	2000 SEP 2.5	19.94	318.5	-0.70	184.1	27.4	19.01	30.10	304.8	0.20	298.1	-25.9	29.28	30.20	251.8	10.78	206.4	0.0	30.18
51800.0	2000 SEP 12.5	19.94	318.6	-0.70	184.1	27.3	19.09	30.10	304.9	0.20	298.1	-25.9	29.39	30.20	251.9	10.77	206.5	0.0	30.35
51810.0	2000 SEP 22.5	19.94	318.7	-0.70	184.1	27.2	19.19	30.10	304.9	0.20	298.2	-25.9	29.52	30.21	252.0	10.75	206.5	0.0	30.51
51820.0	2000 OCT 2.5	19.94	318.8	-0.70	184.1	27.1	19.32	30.10	305.0	0.20	298.3	-25.8	29.67	30.21	252.0	10.74	206.6	0.0	30.67
51830.0	2000 OCT 12.5	19.95	318.9	-0.70	184.0	27.0	19.47	30.10	305.1	0.19	298.3	-25.8	29.83	30.21	252.1	10.72	206.7	0.0	30.81
51840.0	2000 OCT 22.5	19.95	319.0	-0.70	184.0	26.9	19.63	30.10	305.1	0.19	298.4	-25.8	30.00	30.22	252.2	10.71	206.7	0.0	30.93
51850.0	2000 NOV 1.5	19.95	319.1	-0.70	184.0	26.8	19.79	30.10	305.2	0.19	298.5	-25.8	30.18	30.22	252.2	10.69	206.8	0.0	31.04
51860.0	2000 NOV 11.5	19.95	319.3	-0.70	184.0	26.7	19.97	30.10	305.2	0.19	298.5	-25.8	30.34	30.22	252.3	10.68	206.9	0.0	31.12
51870.0	2000 NOV 21.5	19.95	319.4	-0.70	184.0	26.6	20.14	30.10	305.3	0.19	298.6	-25.8	30.51	30.23	252.3	10.66	206.9	0.0	31.17
51880.0	2000 DEC 1.5	19.95	319.5	-0.70	184.0	26.5	20.30	30.10	305.4	0.18	298.6	-25.8	30.65	30.23	252.4	10.65	207.0	0.0	31.20
51890.0	2000 DEC 11.5	19.95	319.6	-0.71	183.9	26.4	20.46	30.10	305.4	0.18	298.7	-25.7	30.78	30.23	252.5	10.63	207.1	0.0	31.19
51900.0	2000 DEC 21.5	19.95	319.7	-0.71	183.9	26.2	20.59	30.09	305.5	0.18	298.8	-25.7	30.90	30.23	252.5	10.62	207.1	0.0	31.16
51910.0	2001 JAN 0.5	19.95	319.8	-0.71	183.9	26.1	20.71	30.09	305.5	0.18	298.8	-25.7	30.98	30.24	252.6	10.60	207.2	0.0	31.10
51920.0	2001 JAN 10.5	19.95	319.9	-0.71	183.9	26.0	20.81	30.09	305.6	0.18	298.9	-25.7	31.04	30.24	252.7	10.58	207.2	0.0	31.02
51930.0	2001 JAN 20.5	19.96	320.0	-0.71	183.9	25.9	20.88	30.09	305.7	0.18	299.0	-25.7	31.07	30.24	252.7	10.57	207.3	0.0	30.91
51940.0	2001 JAN 30.5	19.96	320.1	-0.71	183.8	25.8	20.93	30.09	305.7	0.17	299.0	-25.7	31.08	30.25	252.8	10.55	207.4	0.0	30.78
51950.0	2001 FEB 9.5	19.96	320.2	-0.71	183.8	25.7	20.94	30.09	305.8	0.17	299.1	-25.7	31.05	30.25	252.9	10.54	207.4	0.0	30.64
51960.0	2001 FEB 19.5	19.96	320.3	-0.71	183.8	25.6	20.93	30.09	305.8	0.17	299.2	-25.6	31.00	30.25	252.9	10.52	207.5	0.0	30.48
51970.0	2001 MAR 1.5	19.96	320.4	-0.71	183.8	25.5	20.89	30.09	305.9	0.17	299.2	-25.6	30.91	30.26	253.0	10.51	207.6	0.0	30.32
51980.0	2001 MAR 11.5	19.96	320.6	-0.71	183.8	25.4	20.83	30.09	306.0	0.17	299.3	-25.6	30.81	30.26	253.1	10.49	207.6	0.0	30.15
51990.0	2001 MAR 21.5	19.96	320.7	-0.71	183.8	25.3	20.74	30.09	306.0	0.16	299.4	-25.6	30.68	30.26	253.1	10.48	207.7	0.0	29.99
52000.0	2001 APR 0.5	19.96	320.8	-0.71	183.7	25.2	20.62	30.09	306.1	0.16	299.4	-25.6	30.54	30.27	253.2	10.46	207.8	0.0	29.83
52010.0	2001 APR 10.5	19.96	320.9	-0.71	183.7	25.1	20.49	30.09	306.1	0.16	299.5	-25.6	30.38	30.27	253.3	10.45	207.8	0.0	29.69
52020.0	2001 APR 20.5	19.96	321.0	-0.71	183.7	25.0	20.35	30.09	306.2	0.16	299.5	-25.6	30.22	30.27	253.3	10.43	207.9	0.0	29.56
52030.0	2001 MAY 0.5	19.96	321.1	-0.71	183.7	24.9	20.19	30.09	306.3	0.16	299.6	-25.5	30.05	30.28	253.4	10.41	208.0	0.0	29.46
52040.0	2001 MAY 10.5	19.97	321.2	-0.71	183.7	24.8	20.02	30.09	306.3	0.16	299.7	-25.5	29.88	30.28	253.4	10.40	208.0	0.0	29.38
52050.0	2001 MAY 20.5	19.97	321.3	-0.71	183.6	24.5	19.86	30.09	306.4	0.15	299.7	-25.5	29.72	30.28	253.5	10.38	208.1	0.0	29.32
52060.0	2001 MAY 30.5	19.97	321.4	-0.71	183.6	24.5	19.69	30.09	306.4	0.15	299.8	-25.5	29.56	30.29	253.6	10.37	208.2	0.0	29.29
52070.0	2001 JUN 9.5	19.97	321.5	-0.72	183.6	24.4	19.53	30.09	306.5	0.15	299.9	-25.5	29.43	30.29	253.6	10.35	208.2	0.0	29.30
52080.0	2001 JUN 19.5	19.97	321.6	-0.72	183.6	24.3	19.39	30.09	306.6	0.15	299.9	-25.5	29.31	30.29	253.7	10.34	208.3	0.0	29.33
52090.0	2001 JUN 29.5	19.97	321.7	-0.72	183.6	24.2	19.26	30.09	306.6	0.15	300.0	-25.5	29.21	30.30	253.8	10.32	208.4	0.0	29.38
52100.0	2001 JUL 9.5	19.97	321.9	-0.72	183.6	24.1	19.15	30.09	306.7	0.14	300.1	-25.4	29.14	30.30	253.8	10.31	208.4	0.0	29.47
52110.0	2001 JUL 19.5	19.97	322.0	-0.72	183.5	24.0	19.06	30.09	306.7	0.14	300.1	-25.4	29.09	30.30	253.9	10.29	208.5	0.0	29.57
52120.0	2001 JUL 29.5	19.97	322.1	-0.72	183.5	23.9	19.00	30.09	306.8	0.14	300.2	-25.4	29.07	30.31	254.0	10.27	208.6	0.0	29.70
52130.0	2001 AUG 8.5	19.97	322.2	-0.72	183.5	23.8	18.97	30.09	306.9	0.14	300.3	-25.4	29.09	30.31	254.0	10.26	208.6	0.0	29.85
52140.0	2001 AUG 18.5	19.97	322.3	-0.72	183.5	23.7	18.96	30.09	306.9	0.14	300.3	-25.4	29.13	30.31	254.1	10.24	208.7	0.0	30.00
52150.0	2001 AUG 28.5	19.97	322.4	-0.72	183.5	23.6	18.99	30.09	307.0	0.14	300.4	-25.4	29.20	30.32	254.2	10.23	208.8	0.0	30.17
52160.0	2001 SEP 7.5	19.98	322.5	-0.72	183.4	23.5	19.04	30.09	307.0	0.13	300.4	-25.4	29.29	30.32	254.2	10.21	208.8	0.0	30.34
52170.0	2001 SEP 17.5	19.98	322.6	-0.72	183.4	23.4	19.13	30.09	307.1	0.13	300.5	-25.3	29.41	30.32	254.3	10.20	208.9	0.0	30.51
52180.0	2001 SEP 27.5	19.98	322.7	-0.72	183.4	23.3	19.23	30.09	307.1	0.13	300.6	-25.3	29.55	30.33	254.3	10.18	208.9	0.0	30.67
52190.0	2001 OCT 7.5	19.98	322.8	-0.72	183.4	23.1	19.36	30.09	307.2	0.13	300.6	-25.3	29.70	30.33	254.4	10.16	209.0	0.0	30.83
52200.0	2001 OCT 17.5	19.98	322.9	-0.72	183.4	23.0	19.51	30.09	307.3	0.13	300.7	-25.3	29.87	30.33	254.5	10.15	209.1	0.0	30.96
52210.0	2001 OCT 27.5	19.98	323.0	-0.72	183.4	22.9	19.67	30.09	307.3	0.12	300.8	-25.3	30.04	30.34	254.5	10.13	209.1	0.0	31.08
52220.0	2001 NOV 6.5	19.98	323.2	-0.72	183.3	22.8	19.84	30.09	307.4	0.12	300.8	-25.3	30.21	30.34	254.6	10.12	209.2	0.0	31.18
52230.0	2001 NOV 16.5	19.98	323.3	-0.72	183.3	22.7	20.01	30.09	307.4	0.12	300.9	-25.3	30.38	30.35	254.7	10.10	209.3	0.0	31.26
52240.0	2001 NOV 26.5	19.98	323.4	-0.72	183.3	22.5	20.18	30.09	307.5	0.12	301.0	-25.2	30.53	30.35	254.7	10.09	209.3	0.0	31.30
52250.0	2001 DEC 6.5	19.98	323.5	-0.72	183.3	22.5	20.35	30.09	307.6	0.12	301.0	-25.2	30.68	30.35	254.8	10.07	209.4	0.0	31.32
52260.0	2001 DEC 16.5	19.98	323.6	-0.73	183.3	22.4	20.50	30.09	307.6	0.11	301.1	-25.2	30.81	30.36	254.9	10.06	209.5	0.0	31.31
52270.0	2001 DEC 26.5	19.98	323.7	-0.73	183.3	22.3	20.64	30.09	307.7	0.11	301.2	-25.2	30.91	30.36	254.9	10.04	209.5	0.0	31.28
52280.0	2002 JAN 5.5	19.99	323.8	-0.73	183.2	22.2	20.75	30.08	307.7	0.11	301.2	-25.2	30.99	30.36	255.0	10.02	209.6	0.0	31.21
52290.0	2002 JAN 15.5	19.99	323.9	-0.73	183.2	22.1	20.85	30.08	307.8	0.11	301.3	-25.2	31.04	30.37	255.1	10.01	209.7	0.0	31.12
52300.0	2002 JAN 25.5	19.99	324.0	-0.73	183.2	22.0	20.92	30.08	307.9	0.11	301.3	-25.2	31.07	30.37	255.1	9.99	209.7	0.0	31.01
52310.0	2002 FEB 4.5	19.99	324.1	-0.73	183.2	21.9	20.95	30.08	307.9	0.11	301.4	-25.1	31.06	30.37	255.2	9.98	209.8	0.0	30.87
52320.0	2002 FEB 14.5	19.99	324.2	-0.73	183.2	21.8	20.98	30.08	308.0	0.10	301.5	-25.1	31.03	30.38	255.2	9.96	209.9	0.0	30.73
52330.0	2002 FEB 24.5	19.99	324.3	-0.73	183.2	21.7	20.96	30.08	308.0	0.10	301.5	-25.1	30.97	30.38	255.3	9.94	209.9	0.0	30.57
52340.0	2002 MAR 6.5	19.99	324.4	-0.73	183.1	21.5	20.92	30.08	308.1	0.10	301.6	-25.1	30.88	30.38	255.4	9.93	210.0	0.0	30.40
52350.0	2002 MAR 16.5	19.99	324.6	-0.73	183.1	21.4	20.85	30.08	308.2	0.10	301.7	-25.1	30.77	30.39	255.4	9.91	210.1	0.0	30.24
52360.0	2002 MAR 26.5	19.99	324.7	-0.73	183.1	21.3	20.76	30.08	308.2	0.10	301.7	-25.1	30.64	30.39	255.5	9.90	210.1	0.0	30.08
52370.0	2002 APR 5.5	19.99	324.8	-0.73	183.1	21.2	20.65	30.08	308.3	0.09	301.8	-25.0	30.49	30.39	255.6	9.88	210.2	0.0	29.92
52380.0	2002 APR 15.5	19.99	324.9	-0.73	183.1	21.1	20.52	30.08	308.3	0.09	301.9	-25.0	30.33	30.40	255.6	9.87	210.2	0.0	29.78
52390.0	2002 APR 25.5	19.99	325.0	-0.73	183.0	21.0	20.37	30.08	308.4	0.09	301.9	-25.0	30.17	30.40	255.7	9.85	210.3	0.0	29.66

Section 3

SINGLE-PLANET SWINGBY MISSION CONTOUR CHARTS

The single-planet (Jupiter) swingby trajectory data are presented graphically in this section. The data provide the means to ascertain regions of interest within a particular launch opportunity and to determine the gross variations of energy requirements as a function of launch year.

There are five charts for each target planet. These span the launch years 1976-1980 for Saturn (Figures 3-1 through 3-5), 1978-1983 for Uranus and Neptune (Figures 3-6 through 3-15) and 1976-1980 for Pluto (Figures 3-16 through 3-20). Although launch opportunities exist for swingby missions before and after these opportunities, they are of no interest in mission planning. The earlier launch opportunities are characterized by long flight times and narrow launch windows. For the later launch opportunities, the flight time/energy requirements are inferior to the requirements for direct trips.

A launch opportunity is defined as occurring in the year in which the minimum departure energy missions are found. This classification is necessary since missions to Jupiter departing around 1980 have launch windows which encompass parts of two calendar years. Actually, all launch opportunities within the time periods given above are included in this data. The charts show contours of constant Earth departure hyperbolic excess speed, target planet arrival excess speed, perijove radius, and the date of swingby as a function of the dates of Earth departure and target planet arrival. The 180° transfer ridge, denoted by the heavy solid line running diagonally up each chart, applies to the Earth-Jupiter transfer leg.

In the patched conic analysis used to obtain the data in this handbook, the sole effect of a swingby is assumed to be the rotation of the spacecraft's velocity vector (specifically, the hyperbolic excess velocity vector). Since no perturbation of the velocity magnitude is allowed, the incoming and outgoing hyperbolic excess speeds at the encounter planet must be equal in order for a swingby to occur. In general, this equality can be satisfied on several

different swingby dates given a particular Earth departure date and a target planet arrival date; that is, multiple solutions are possible. Most of the data included in this handbook belong to two families of solutions although, as will be discussed later, additional families exist.

As mentioned in Section 1, the primary advantage of the swingby mode over the direct mode lies in the flight time reduction which can be obtained. This reduced flight time is made possible, of course, by the heliocentric energy gain resulting from the close Jupiter encounter. The maximum gain in energy occurs when the outgoing hyperbolic excess velocity and the planet's heliocentric velocity are parallel. However, this condition is usually unattainable or undesirable from the standpoint of satisfying the mission objectives. For the swingby missions considered here, the turn angle (the angle through which the excess velocity vector is rotated during encounter) and, thus, the energy gain are completely specified by the mission. That is, once the dates of Earth departure and target planet arrival are chosen, the required trajectories between Earth-swingby planet and swingby planet-target planet are completely determined (as mentioned previously, there may be more than one solution). With the two transfer legs specified, the turn angle at encounter is also defined. The energy gain required for these swingby missions will, therefore, be primarily a function of the relative planetary geometry of the launch opportunity. Nevertheless, the energy gain for these practical missions is usually sufficient to yield trajectories after planet encounter that are hyperbolic with respect to the sun.

Due to the small relative motion between Jupiter and the remaining outer planets, several adjacent launch years for swingby missions are available during every Jupiter-target planet synodic period. The first attractive opportunity will appear when the angular separation between Jupiter and the target planet is small enough to permit missions which do not impact Jupiter and arrive at the target planet in a reasonable amount of time. With each later launch opportunity within this period, the angular separation of Jupiter relative to the target planet becomes smaller. As the separation decreases, the post-encounter heliocentric velocity of the transfer trajectory must possess a larger radial component. This implies that a smaller turn angle is required at encounter and as a result, that less gain in heliocentric energy is obtainable from the swingby. This, in turn, implies that the Earth departure energy will have to

increase in order to provide the necessary energy to perform the mission in the desired flight time. This trend continues until the effect of the Jupiter encounter is negligible or, equivalently, the post-encounter heliocentric trajectory approaches a direct (single leg) Earth-target planet trajectory.

Evidence of these phenomena can be seen in the graphical data contained in this section. The earliest launch years for swingby missions to a particular target planet exhibit the lowest Earth departure energy requirements, coincident with the largest angular separation of Jupiter and the target planet. The large turn angles required for these early missions also result in small passage distances at Jupiter. In fact, the requirement that the periapsis radius be at least one planetary radius in order to perform the mission eliminates many of the short flight time missions from consideration. This occurs for missions to each of the target planets during the first two attractive launch opportunities. With progressing launch year the required turn angles decrease (as indicated by the increasing periapsis radii) and the departure energy increases. This trend reaches its peak at the last reasonable launch opportunity within a Jupiter-target planet synodic period. Considering swingby missions to the four target planets during the last available opportunity, only those to Pluto are superior to the direct mode.

All of the graphical data which follow belong to two families of swingby solutions. The first of these families is typified by Type I Earth-Jupiter transfers, the other by Type II Earth-Jupiter transfers. In either case, the Jupiter-target planet trajectories are Type I. In addition to these, six other families of solutions were found in the range of dates investigated for the preparation of this handbook. Two of these solutions are always paired: one Type I, one Type II Earth-Jupiter near-180° transfer. These missions have Type I Jupiter-target planet transfers and are usually associated with the nominal Type I (Earth-Jupiter) family. Due to the location of these missions near the 180° transfer ridge, the Earth departure excess speeds are generally prohibitive. The remaining four families are also part of a set in which both Type I and Type II Earth-Jupiter are paired with near-180° Type I and Type II Jupiter-target planet transfers. Although these missions are characterized by favorable Earth departure excess speed requirements and departure windows, the flight time associated with these missions are generally too long to make them of practical interest.

CONTOUR CHARTS FOR

JUPITER SWINGBY MISSIONS TO SATURN

1976 - 1980

1976-1980 Earth-Saturn Missions Using Jupiter Swingby

These missions exhibit the lowest Earth departure energy requirements of the available outer planet swingby missions. The minimum excess speed requirements range from about 0.31 EMOS in 1976 and 1980 to about 0.32 EMOS in 1978. Extensive regions exist about these minimum points for which the departure excess speeds are less than that required for a direct Hohmann transfer to Saturn. The minimum flight times associated with these "sub-Hohmann" regions are generally greater than 1200 days for all launch opportunities, varying from about 1180 days in 1978 to 2270 days in 1980. Since the Hohmann transfer is often not representative of the actual minimum energy mission during a particular launch year, the swingby mission flight time/energy requirements were compared with those for actual direct missions in the launch years from 1976 to 1980. This indicates that for launches from 1977 to 1979 the swingby mode exhibits shorter flight times than the direct mode at low departure energies although as the energy is increased the flight time advantage of swingby rapidly decreases. For example, at energy levels corresponding to the actual minimum departure energy for a direct mission (about 0.385 EMOS), the flight time advantage of a swingby is about 250 days in 1977, 400 days in 1978, and 370 days in 1979. When the excess speed is increased to 0.5 EMOS the difference between swingby and direct decreases to about 30 days in 1978 and 50 days in 1979. For launches in 1977 at this energy the swingby flight time is about 50 days longer than the direct.

For launches in 1976 and 1980 the situation is somewhat different than that for launches from 1977 to 1979. In 1976 the flight time is restricted to values greater than 1300 days by the low periapsis radius at Jupiter. At this flight time the swingby mission departure energy is less than the minimum direct energy requirement and a flight time comparison similar to that in the preceding paragraph is not possible. In 1980 a flight time comparison shows that the direct mode is equal or superior to the swingby mode at departure excess speeds down to about 0.38 EMOS. At this departure excess speed (0.38 EMOS), which corresponds to the value for the minimum energy direct mission (Type I),

the flight time for both the direct and swingby modes is about 1480 days (4 years). For longer flight times, the swingby mode is more favorable since the departure energy contines to decrease while the energy requirement for the direct missions are slowly increasing.

The approach and encounter conditions for missions in 1976 and 1977 show considerable variation. At flight times greater than about 2000 days in 1976 and about 3100 days in 1977, all missions (both Type I and Type II) approach Jupiter from the dark side. The Jupiter encounters for these missions remain the same as for the lightside approaches: posigrade, low equatorial inclination. However, the darkside approach is followed by a perijove passage on the light side of the planet, while just the opposite holds true for the lightside approach.

The combination of moderate perijove radii and low departure energies for these two launch opportunities is the most favorable available. The regions in which the departure excess speed is equal to or less than the Hohmann value yields passages at 1 to 3 planet radii and flight times from 1300 to 2100 days in 1976. In 1977 the range is 5 to 20 planet radii at flight times from 1100 days to more than 3000 days.

Missions in 1978 and 1979 are generally characterized by posigrade encounters having both a lightside approach and a lightside perijove. These missions exhibit the best flight time improvements over direct missions of the five launch years condisered; however, this could, in effect, be cancelled by the large perijove radii associated with departure in these launch years which reduces the planetary reconnaissance potential of the encounter at Jupiter.

Missions in 1980 present an interesting situation. These missions (both Type I and Type II) progress from encounters characterized by retrograde, low inclination hyperbolas to encounters having posigrade, low inclination hyperbolas. At flight times of about 2200 days and more, all the encounter trajectories are posigrade. As the missions change from retrograde to posigrade, the equatorial inclination increases to values near 90°. All trajectories approach Jupiter from the lightside with the sub-perijove point on the darkside for the retrograde passage, and on the lightside for the posigrade passages.

Within the range of dates shown on the contour charts there exists an alternate "family" of missions which is not shown since this family is not as extensive as the one shown. Certain missions of this family are, however, listed in the

tabular data. This family is typified by near-180^{o} transfers between Jupiter and Saturn. They are observed to occur in 1976 and 1980; however, there is no reason to assume they do not exist in the other launch opportunities as well. In general, the Jupiter encounter trajectories exhibit the following characteristics as flight time increases: the encounter inclination gradually changes from near polar retrograde to near polar posigrade, the asymptote approach direction shifts from lightside to darkside, and the perijove location moves from dark to light side. The Jupiter-Saturn transfers are, of course, rather highly inclined, with large asymptote declinations at Saturn. These missions occur at long total flight times (around 4000 days in 1976 and 6000 days in 1980) which minimizes their desirability. In 1976, however, they do have significantly lower departure energies than the nominal missions of similar flight time illustrated in the contour chart. In fact, the minimum Earth departure energy for these alternate missions is the same as the minimum departure energy associated with the nominal missions. This occurs since they both use the same Earth-Jupiter transfer leg.

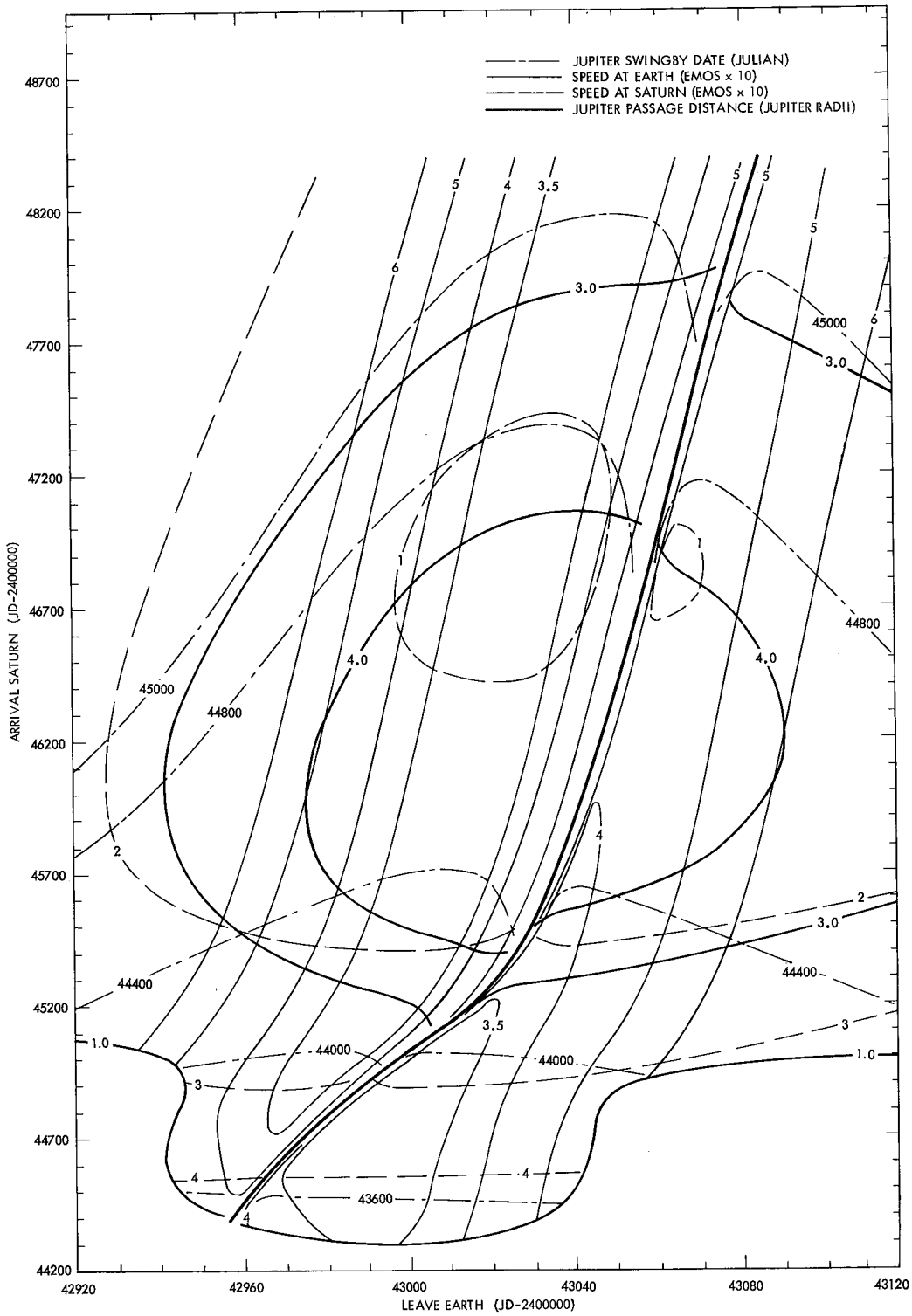

FIGURE 3-1 SATURN MISSIONS USING JUPITER SWINGBY (1976)

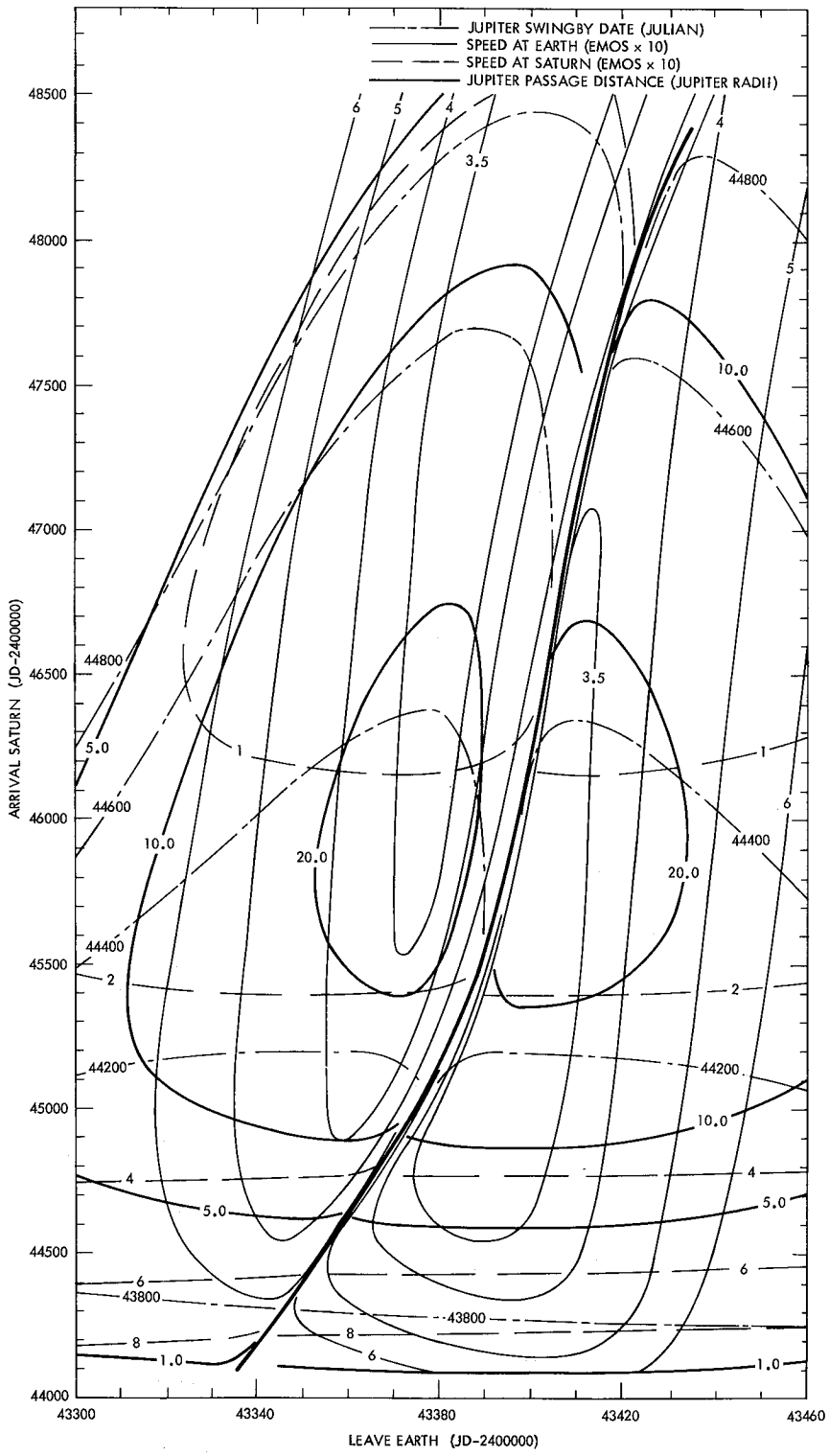

FIGURE 3-2 SATURN MISSIONS USING JUPITER SWINGBY (1977)

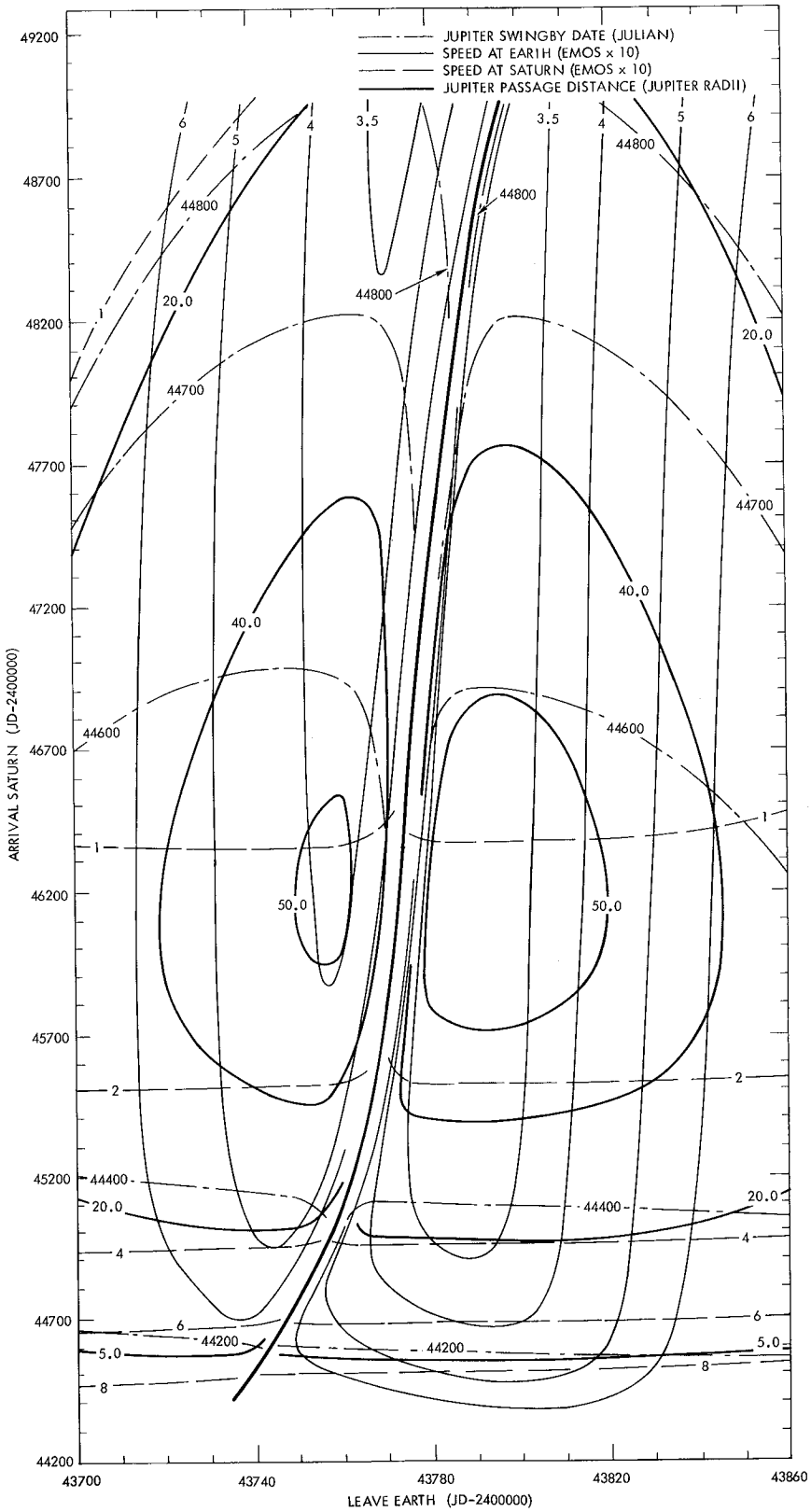

FIGURE 3-3 SATURN MISSIONS USING JUPITER SWINGBY (1978)

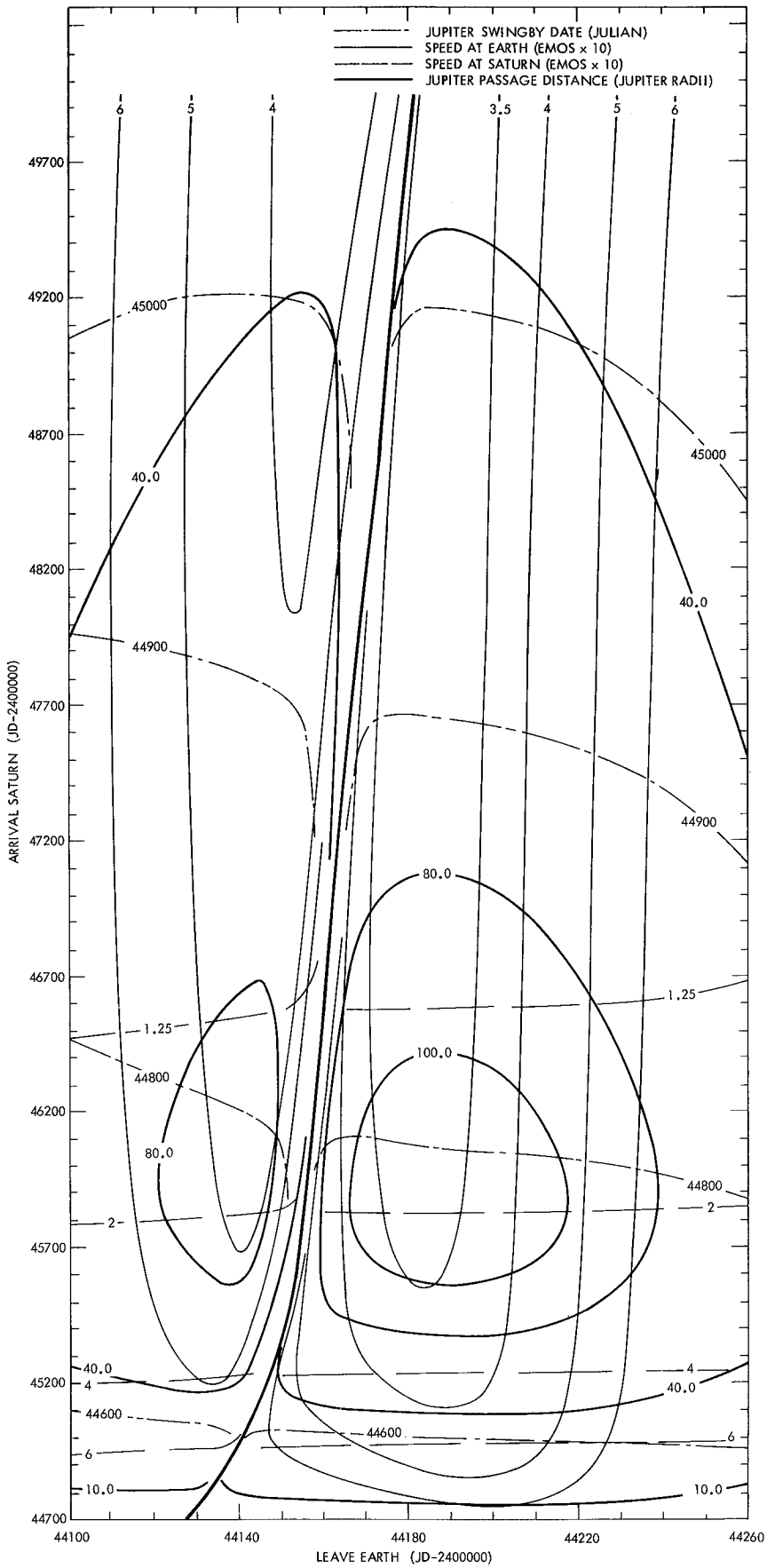

FIGURE 3-4 SATURN MISSIONS USING JUPITER SWINGBY (1979)

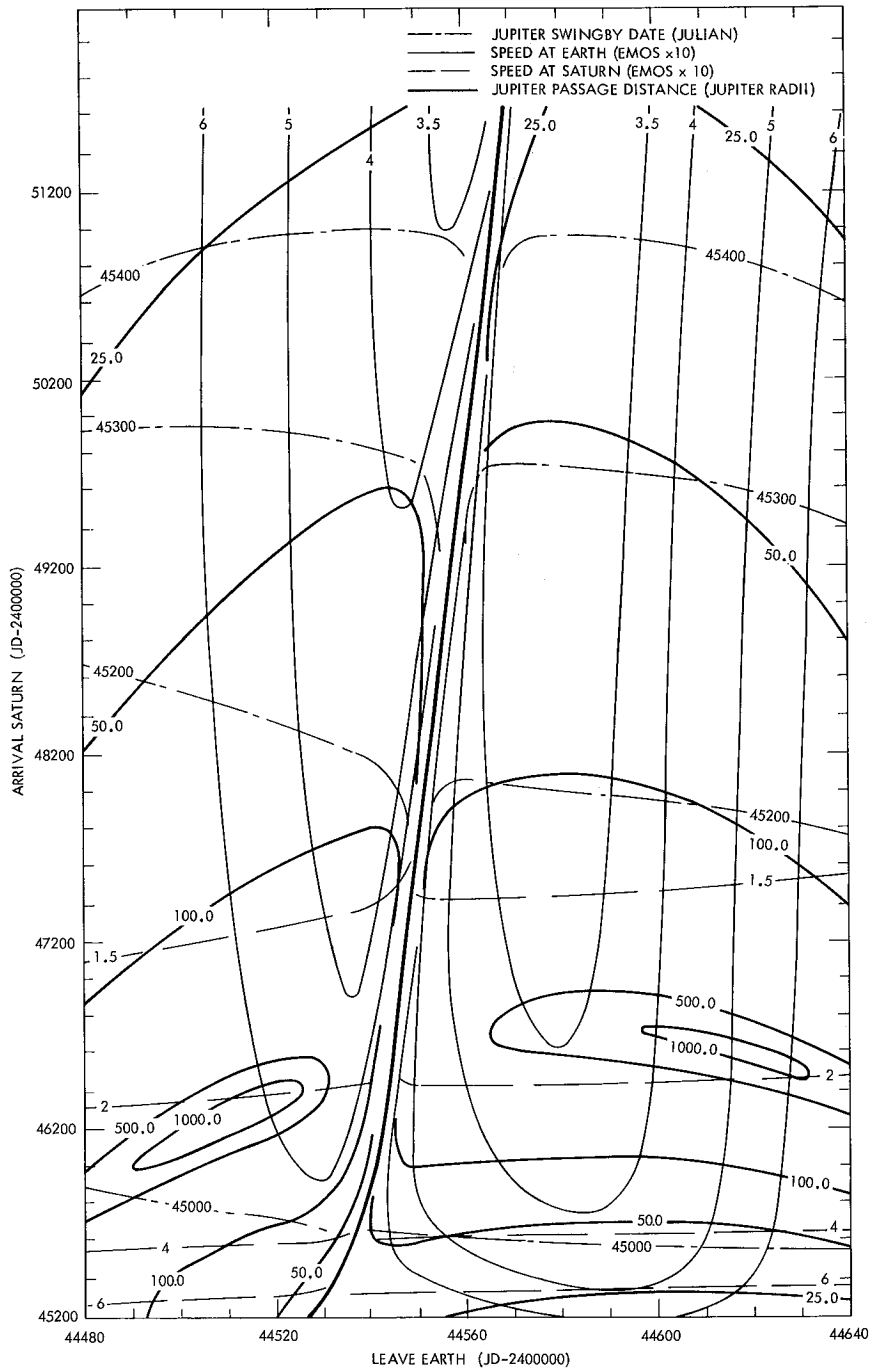

FIGURE 3-5 SATURN MISSIONS USING JUPITER SWINGBY (1980)

CONTOUR CHARTS FOR

JUPITER SWINGBY MISSIONS TO URANUS

1978 - 1983

1978-1983 Earth-Uranus Missions Using Jupiter Swingby

The minimum excess speed required for actual direct missions (Type I) to Uranus during this time period is about 0.38 EMOS with an associated flight time of about 3900 days (10.7 years). Jupiter swingby missions can significantly reduce this time to about 1800 days in 1979 and 2000 days in 1980 for the same departure energy. As the departure energy is increased the flight time improvement attainable with the swingby mode for launches in 1979 and 1980 decreases rapidly to about 1000 days for an Earth departure excess speed of 0.4 EMOS and 250 days for departure at 0.5 EMOS. In the 1978 launch opportunity the limiting value of periapsis radius (1.0 planet radii) restricts the flight time to values greater than 1950 days. At this flight time the minimum departure excess speed is about 0.38 EMOS which is approximately equal to the minimun excess speed required for a direct trip. The swingby flight time at this departure energy is about 1900 days less than the direct flight time.

As the launch year progresses from 1980 to 1983 the relative alignment of Jupiter and Uranus becomes unfavorable. The net effect of this is to render the 1983 launch opportunity non-competitive with direct missions to Uranus.* The minimum flight time, using swingby is greater than the minimum direct flight time throughout the range of equivalent energy levels covered on the contour chart. The flight times for the 1982 missions are also unfavorable (as compared to those in the preceding launch years) although they are slightly superior to the transfer times for direct missions of equal departure energy.

The swingby missions to Uranus included in this report are generally characterized by a lightside approach to Jupiter. The only exceptions are some of the long flight time missions in the 1978 launch opportunity. The encounter trajectories in the 1978-1982 launch opportunities are posigrade, with the subperijove point progressing from the darkside to the lightside of Jupiter as flight time increases. Specifically the periapses are all darkside (for the missions in this report) up to flight times of about 2750 days in the 1978

*The 1983 launch was included to demonstrate effect of increasing launch year on swingby mission requirements.

launch opportunity. For the remaining launch years this flight time limit for a darkside periapsis decreases with launch year to about 2200 days in 1979, 1650 days in 1980, and less than 1600 days in 1982.

With respect to passage conditions, the 1983 launch opportunity is considerably different from the four previous launch years. The relative positions of Jupiter and Uranus can lead to encounters which are retrograde at Jupiter. For a constant arrival date, the launch window contains trajectories which have low inclination retrograde encounters and low inclination posigrade encounters, the retrograde encounters being associated with departures in the middle of the launch window. There is a transition phase between these two types of low inclination encounters during which the equatorial inclination passes through 90°. As the flight time increases, the departure launch window associated with the retrograde passages decreases in extent, until at flight times of around 6500 days all encounters are posigrade. The retrograde encounters are darkside perijove, while the posigrade are lightside.

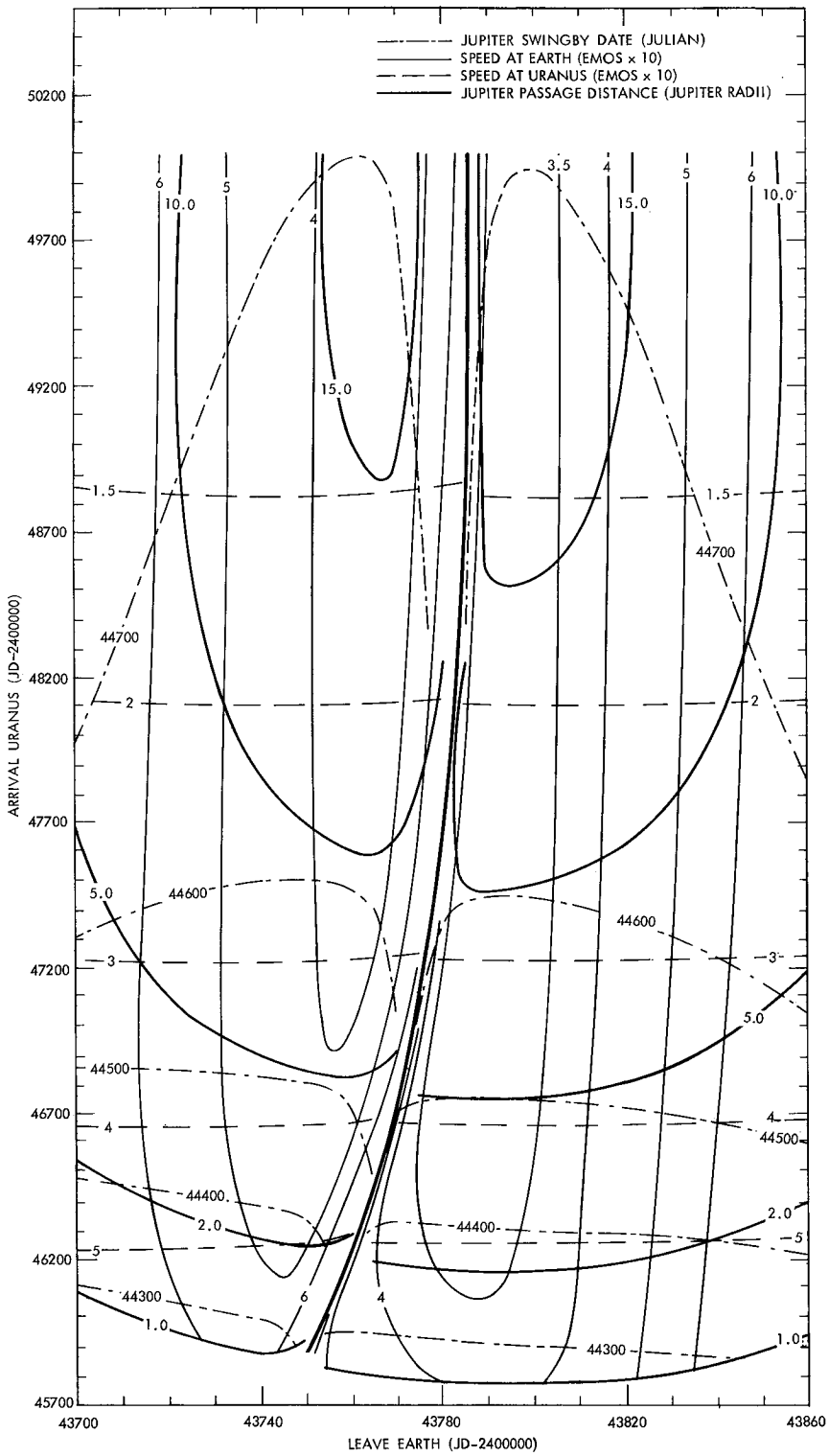

FIGURE 3-6 URANUS MISSIONS USING JUPITER SWINGBY (1978)

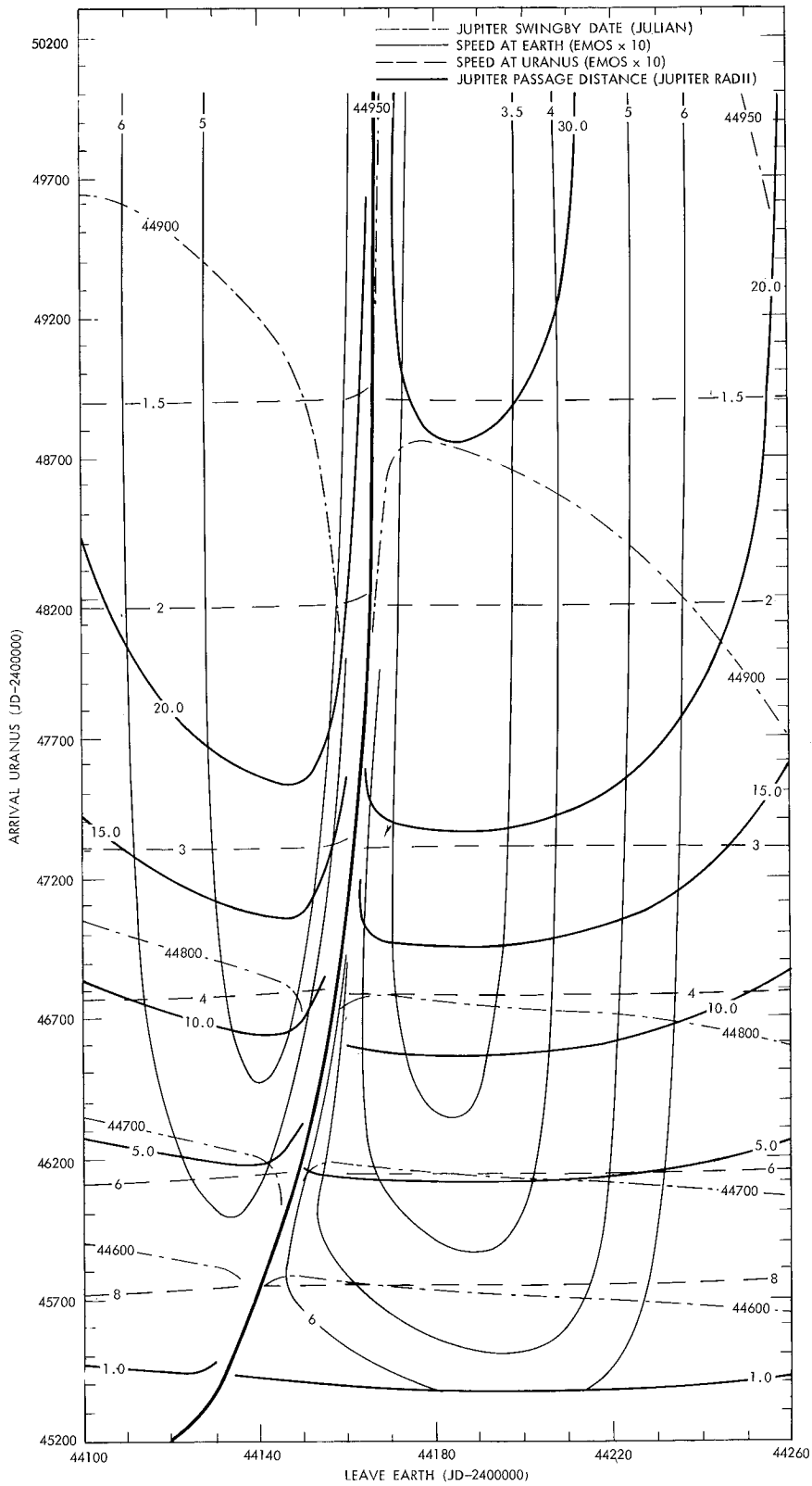

FIGURE 3-7 URANUS MISSIONS USING JUPITER SWINGBY (1979)

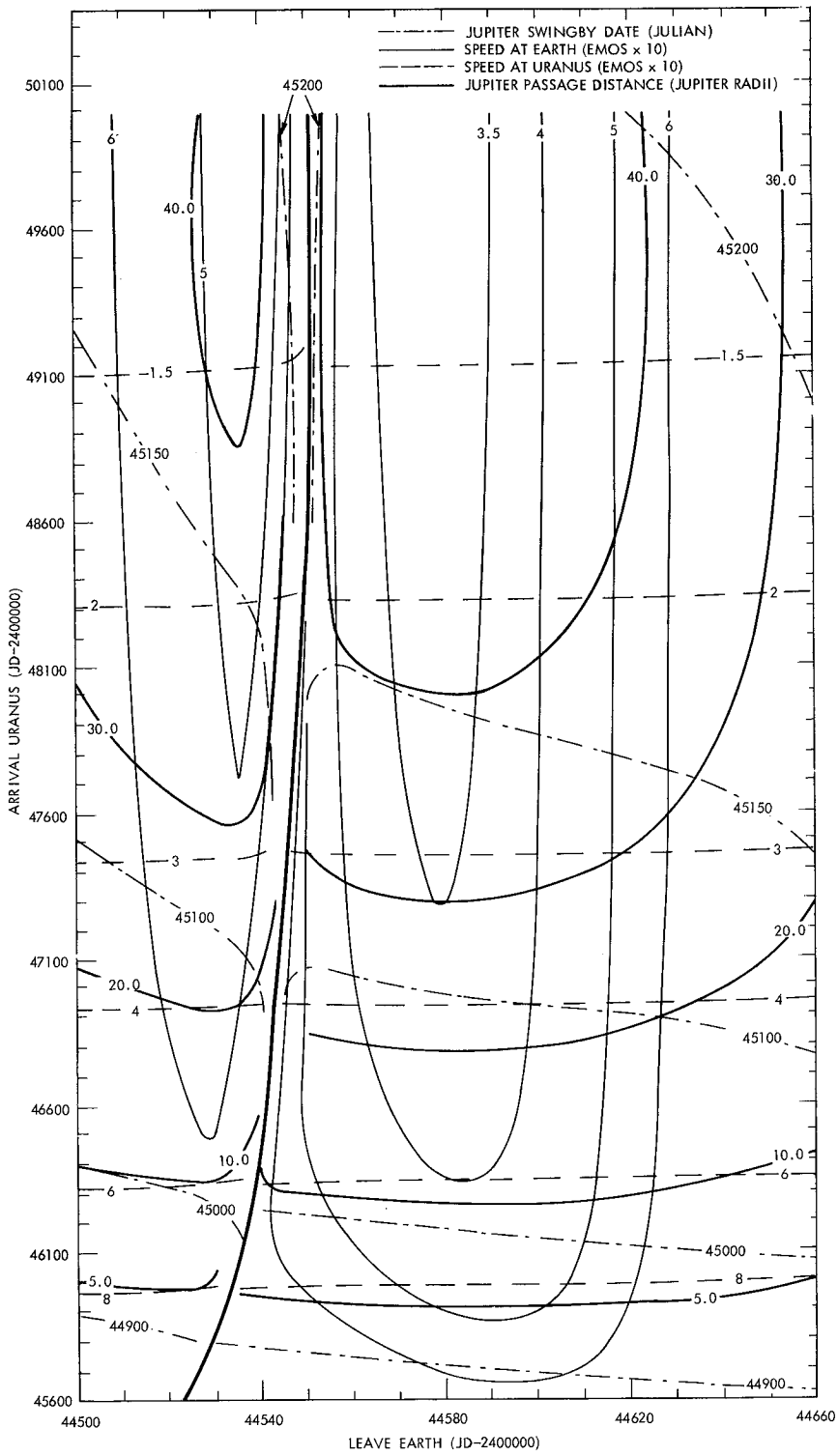

FIGURE 3-8 URANUS MISSIONS USING JUPITER SWINGBY (1980)

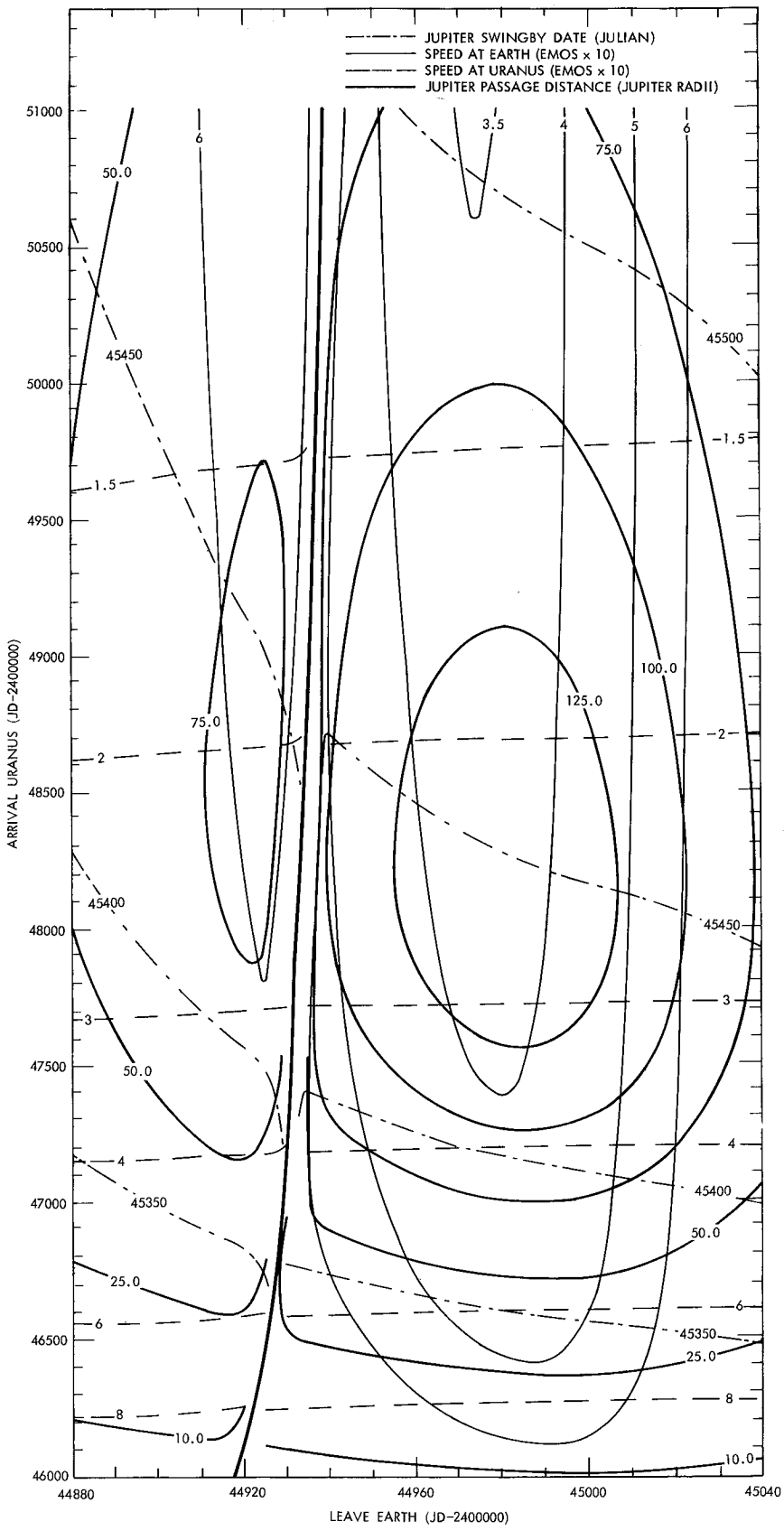

FIGURE 3-9 URANUS MISSIONS USING JUPITER SWINGBY (1982)

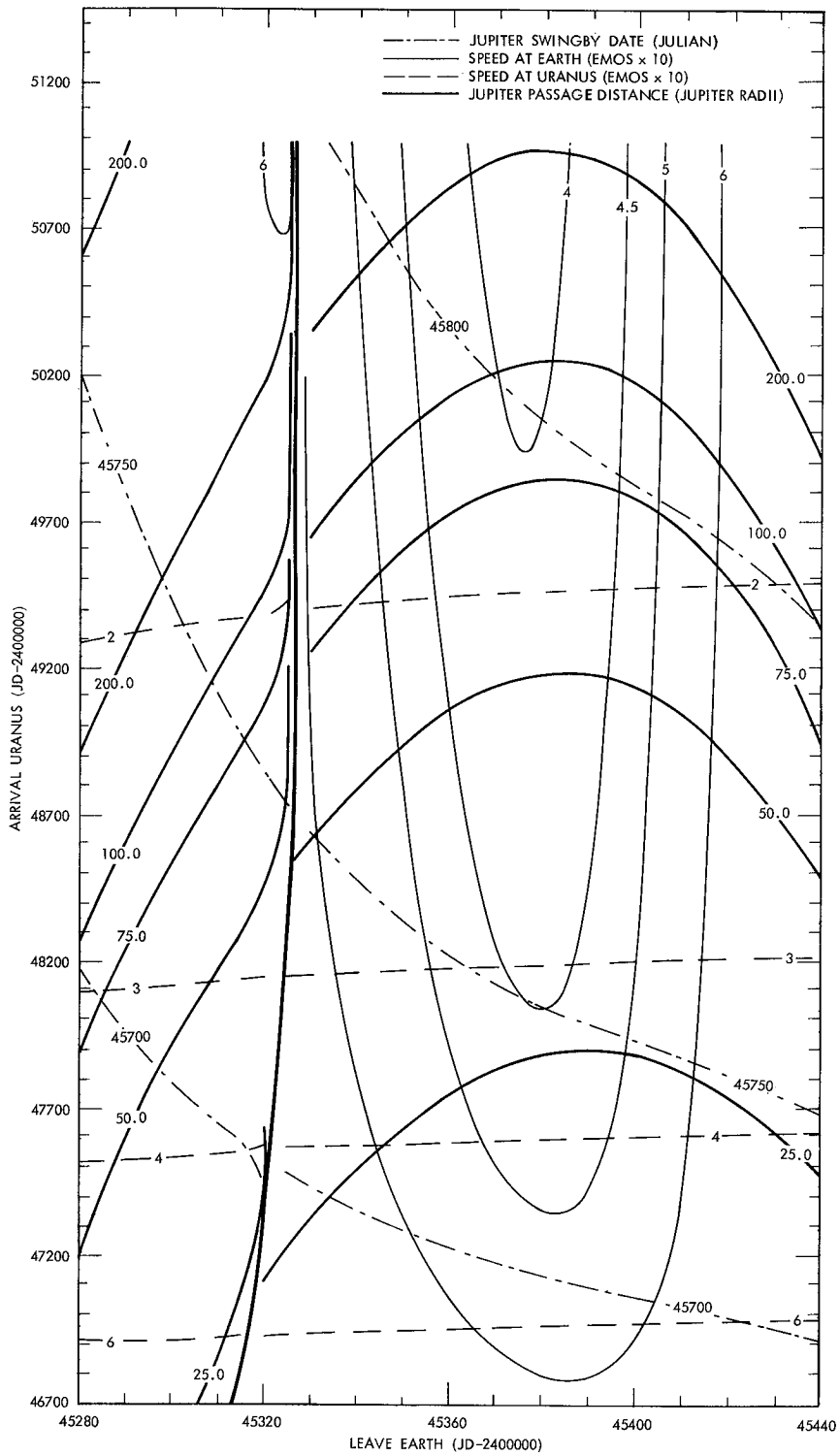

FIGURE 3-10 URANUS MISSIONS USING JUPITER SWINGBY (1983)

CONTOUR CHARTS FOR

JUPITER SWINGBY MISSIONS TO NEPTUNE

1978 - 1983

1978-1983 Earth-Neptune Missions Using Jupiter Swingby

The minimum requirement for actual direct missions to Neptune in this period is about 0.39 EMOS excess speed at Earth departure with an associated flight time of about 8200 days (22.5 years). At the same departure energy, this time can be reduced (with a Jupiter swingby) to about 2700 days (7.4 years) in 1979 and 1980 and 3600 days (9.9 years) in 1982. At a departure excess speed of 0.5 EMOS the time to Neptune, using a swingby, is about 2000 days (5.5 years) in 1980 and 1982 compared to a direct flight of about 2700 days. It should be noted that for missions departing Earth in 1978 and 1979 the restriction on the periapsis at Jupiter places a lower limit on the flight time. This limit is about 4000 days (11.0 years) in 1978 and 2300 days (6.3 years) in 1979.

As the launch year progresses from 1980 to 1983 the relative alignment of Jupiter and Neptune becomes unfavorable. In 1983 the flight times using Jupiter swingby are greater than the direct flight time for equal departure energies. The 1982 launch opportunity opportunity exhibits significantly longer flight times than the earlier swingby launch opportunities; however, the flight times are still considerably shorter than for the available direct missions.

All of these missions are characterized by approaches to Jupiter from the lightside, with the exception of a limited number of long flight time trajectories in the 1978 launch opportunity. The subperijove point progresses from the darkside to the lightside as the flight time increases for missions in the launch years 1978 to 1982. The upper limit on flight time for which the perijove locations are all darkside decreases from about 4800 days in 1978 to less than 2500 days in 1982. The encounter trajectories for these four launch years are all of low inclination, posigrade motion. In the 1983 launch opportunity the planetary alignments are such that many of the encounters are retrograde. The retrograde encounter trajectories are generally of low inclination with darkside perijove locations and occur on Type I Earth-Jupiter transfers. Those few Type II transfers which pass Jupiter retrograde are near-polar, high

passage radius encounters. The retrograde encounters occur throughout the range of flight times shown on the contour chart.

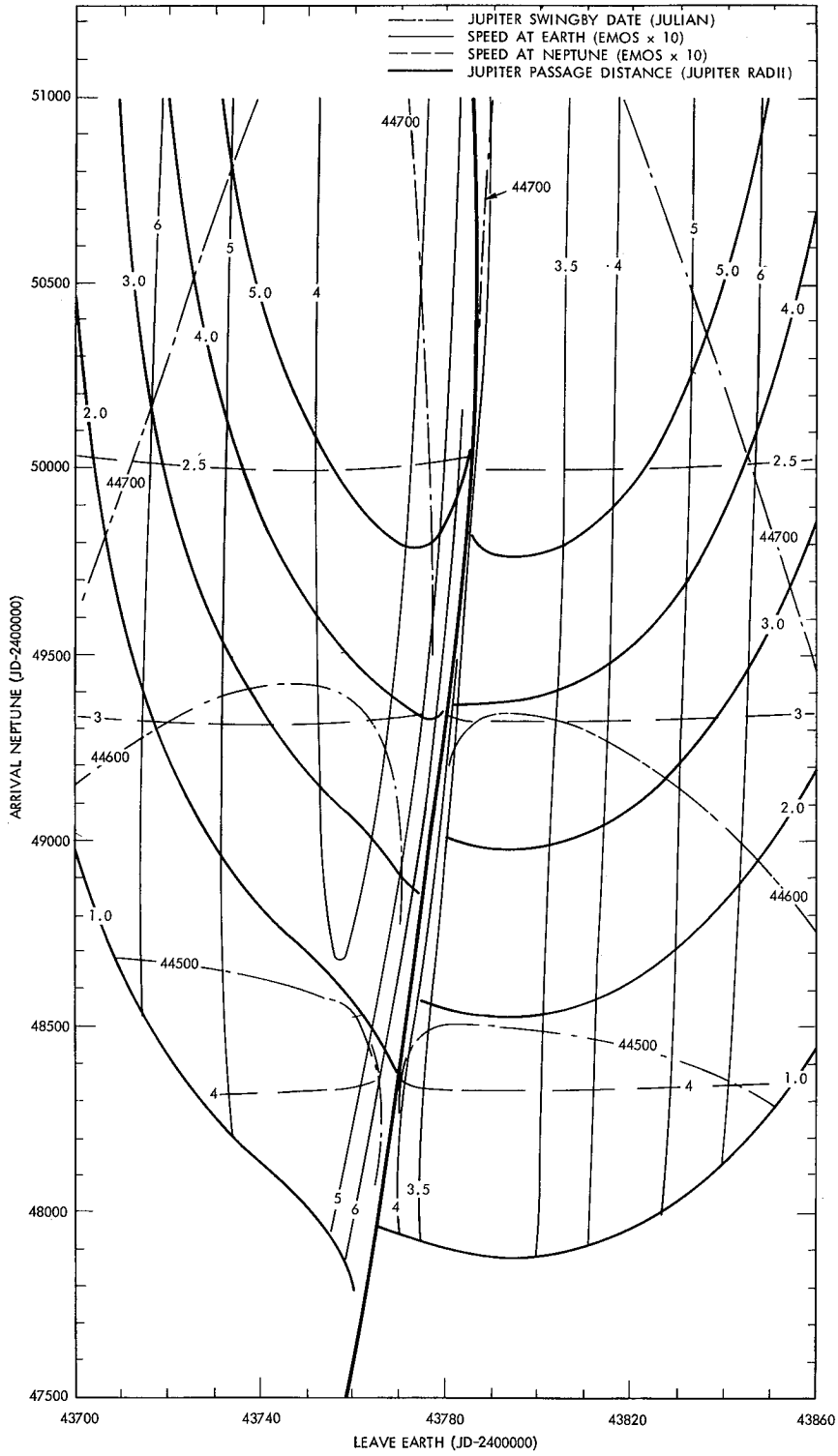

FIGURE 3-11 NEPTUNE MISSIONS USING JUPITER SWINGBY (1978)

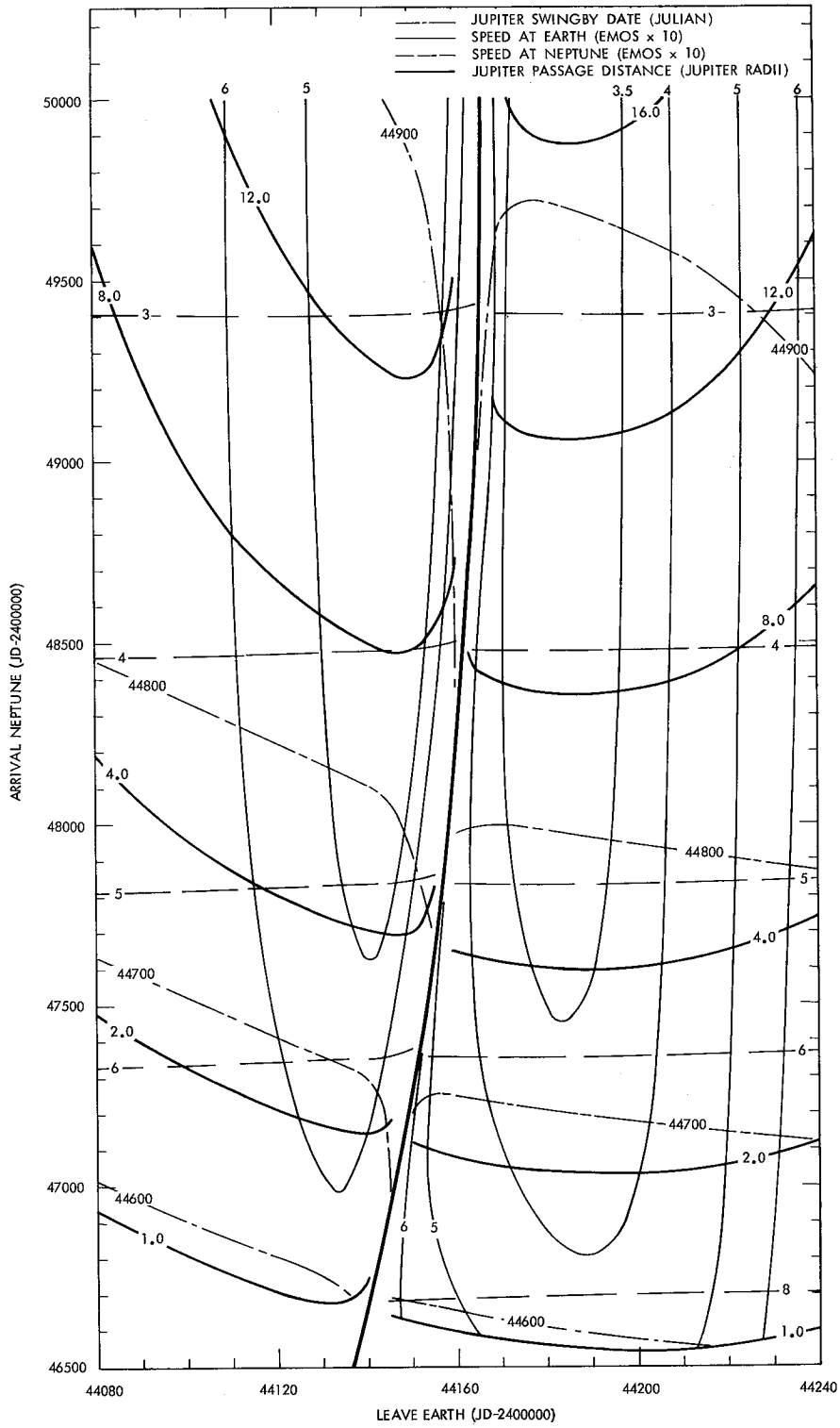

FIGURE 3-12 NEPTUNE MISSIONS USING JUPITER SWINGBY (1979)

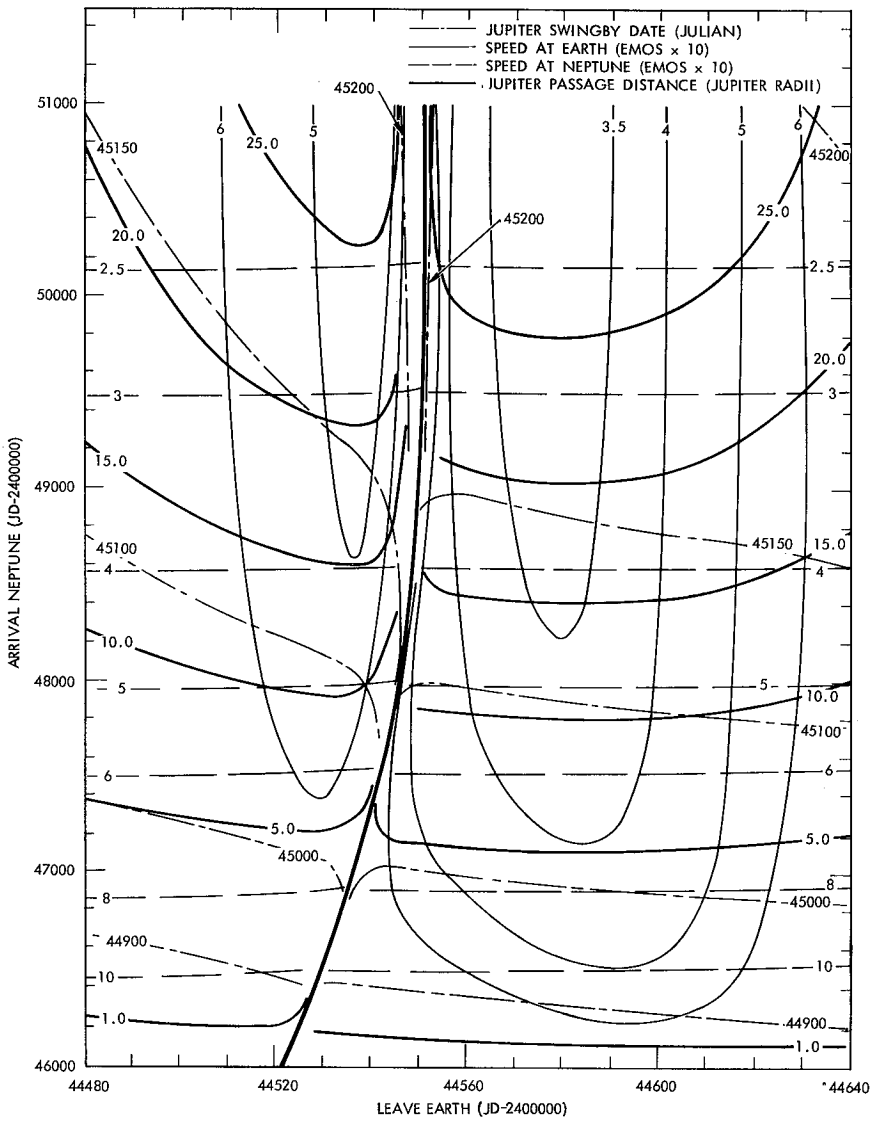

FIGURE 3-13 NEPTUNE MISSIONS USING JUPITER SWINGBY (1980)

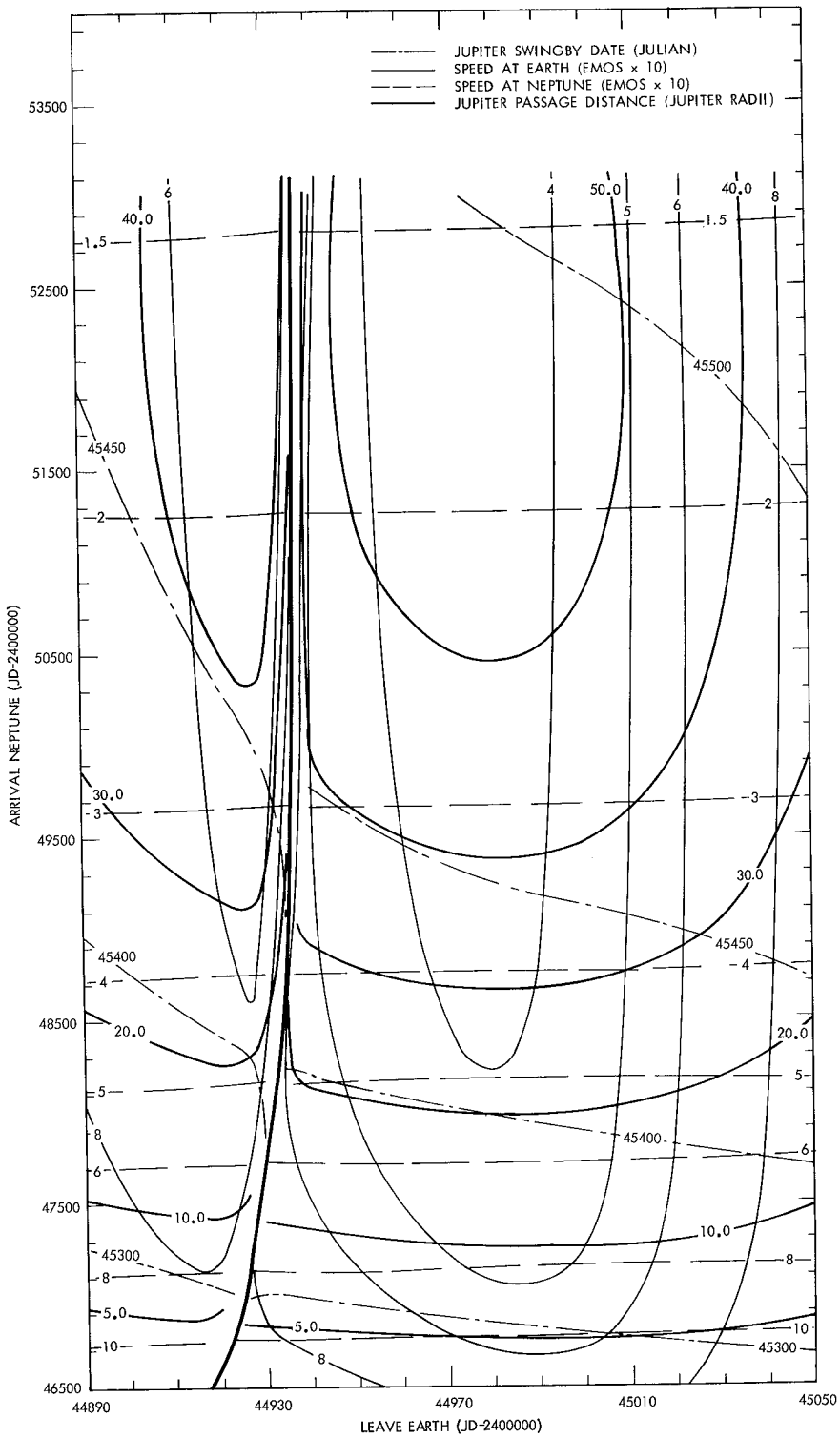

FIGURE 3-14 NEPTUNE MISSIONS USING JUPITER SWINGBY (1982)

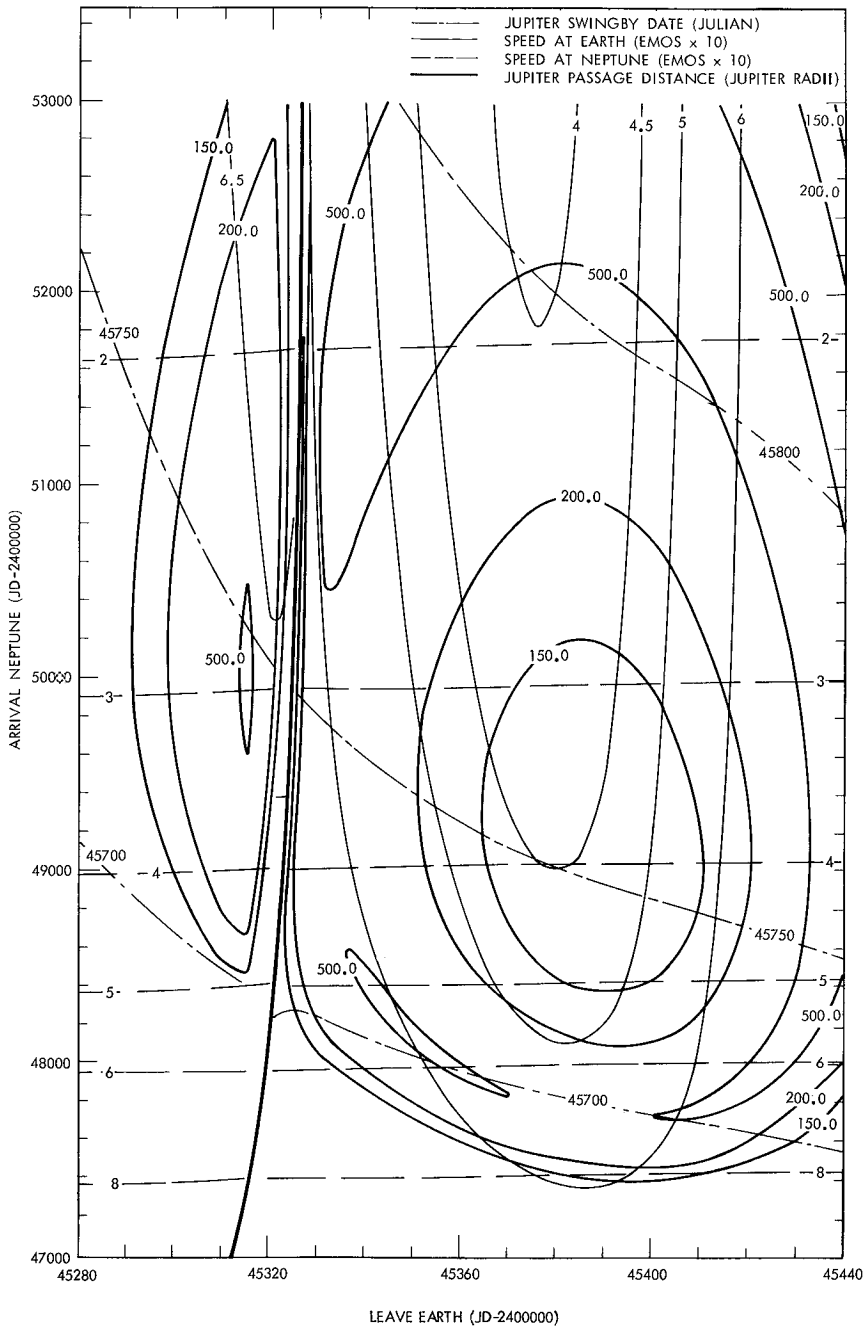

FIGURE 3-15 NEPTUNE MISSIONS USING JUPITER SWINGBY (1983)

CONTOUR CHARTS FOR

JUPITER SWINGBY MISSIONS TO PLUTO

1976 - 1980

1976-1980 Earth-Pluto Missions Using Jupiter Swingby

All launch opportunities contain regions in which the departure excess speed is less than that required for direct Hohmann transfers. The minimum flight times associated with a departure excess speeds equal to that for direct Hohmann transfers vary from about 2600 days (7.1 years) in 1977 to about 6000 days (16.4 years) in 1980. If the departure energy is increased to 0.5 EMOS, the minimum flight times can be reduced to between 5.4 years (in 1978) and 7.5 years (in 1980). This can be compared to a direct flight time of greater than 30 years for a similar Earth departure energy. Also, as can be seen in the contour charts for 1976 and 1977, the minimum allowable perijove radius (1.0 planet radii) in those years places a lower limit on the flight time to Pluto obtainable using a Jupiter swingby. This is about 3800 days (10.4 years) in 1976 and 2300 days (6.3 years) in 1977.

For the missions included on the contour charts, the approach to Jupiter is lightside, with the sub-perijove point progressing from the darkside to the lightside as flight time increases. The first appearance of a lightside perijove varies with launch year, occuring at flight times of about 6000 days in 1976, 5300 days in 1977, 4600 days in 1978, and 3100 days in 1979. For launches in 1980 the appearance of lightside perijove occurs at flight times around 4800 days. The high heliocentric latitude of Pluto throughout the arrival dates included in these missions causes the Jupiter-Pluto transfers to have relatively high inclinations. These are on the order of 10° to 20° in the years 1976 to 1979 and 10° to 40° in 1980. Associated with these inclinations are highly inclined encounter trajectories at Jupiter. For the launch years 1976 to 1979, the encounter inclination lies within the bounds of 20° to 60°. In 1980 the situation is somewhat different. The minimum planetary encounter inclination is about 30°; however, many of the Type I (Earth-Jupiter leg) missions up to about 6000 days duration have near polar planetary inclinations. These missions are in the region of the minimum departure excess speed and include both posigrade and retrograde passages.

As in the case for swingby missions to Saturn, there exists an alternate "family" of swingby missions to Pluto which is not shown since this family is not as extensive as the one shown. These are observed to occur only in the 1976 launch opportunity; however, they may also occur in 1977. It would seem unlikely that they exist for other years, based on the consideration of flight time and relative planetary alignment. These alternate missions are characterized by long flight times (greater than 9000 days) and retrograde, high inclination encounters at Jupiter. The post-encounter heliocentric trajectories are also highly inclined. Due to the long flight time and high energy requirements of these missions, they are of no interest in mission planning.

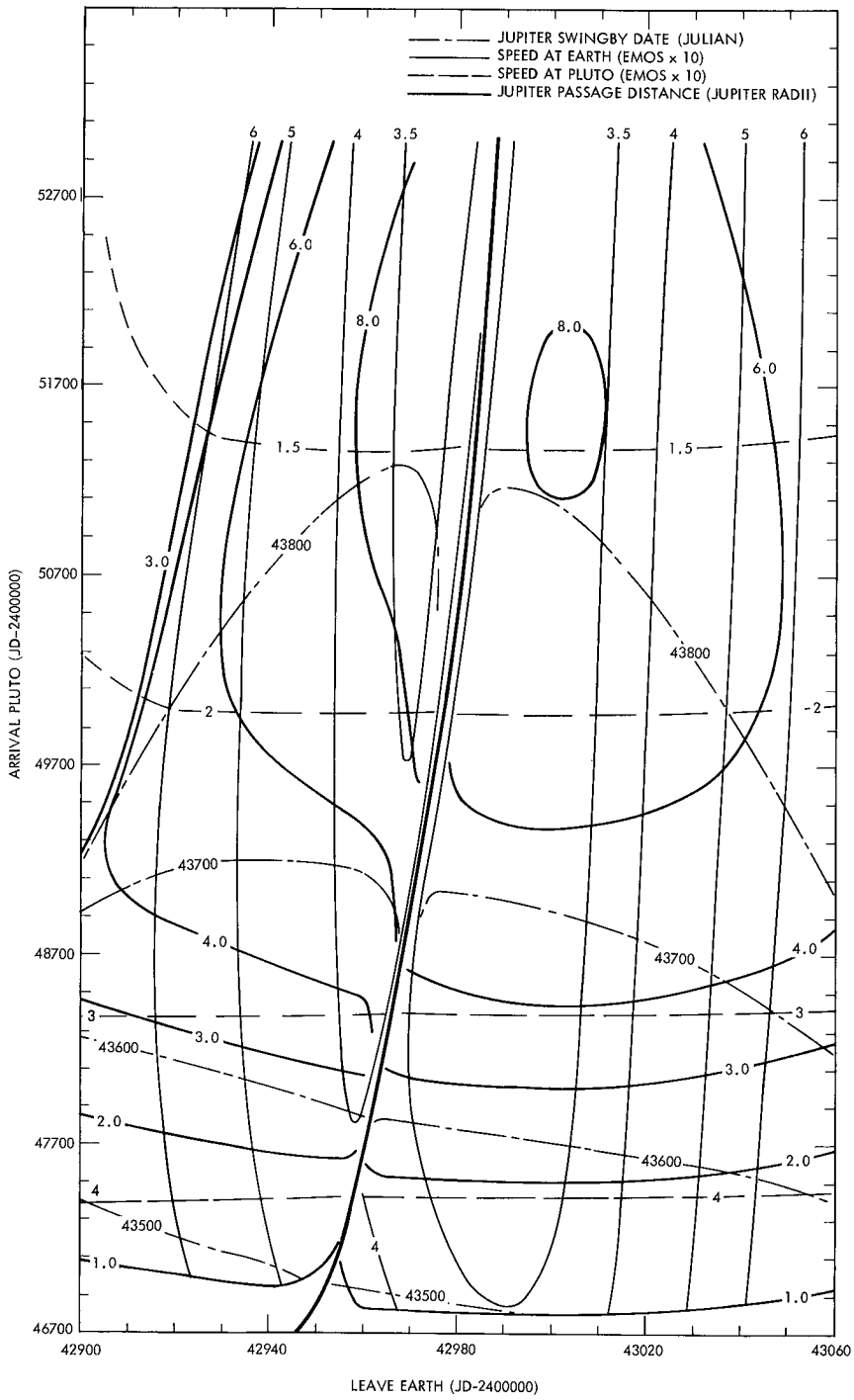

FIGURE 3-16 PLUTO MISSIONS USING JUPITER SWINGBY (1976)

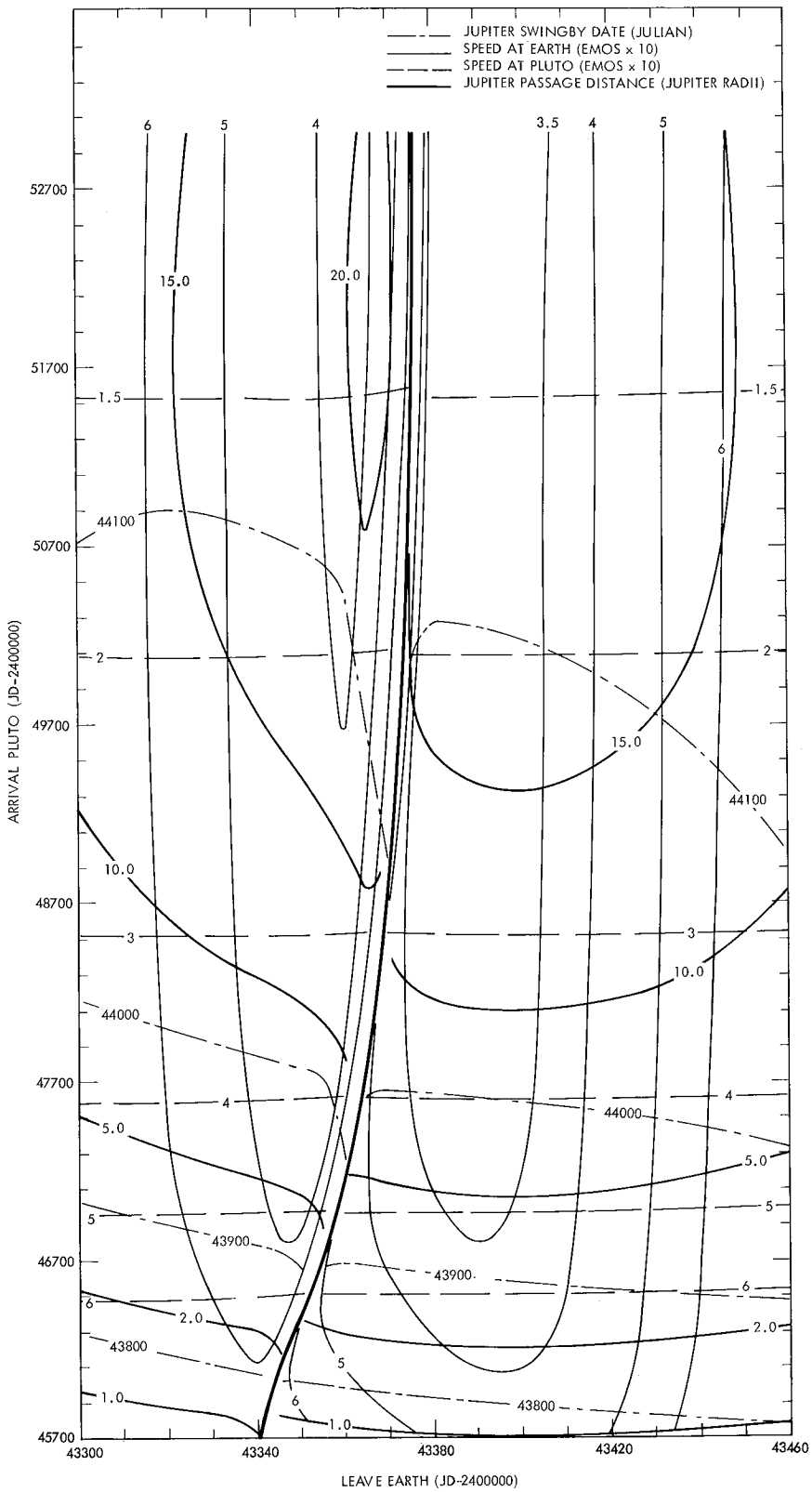

FIGURE 3-17 PLUTO MISSIONS USING JUPITER SWINGBY (1977)

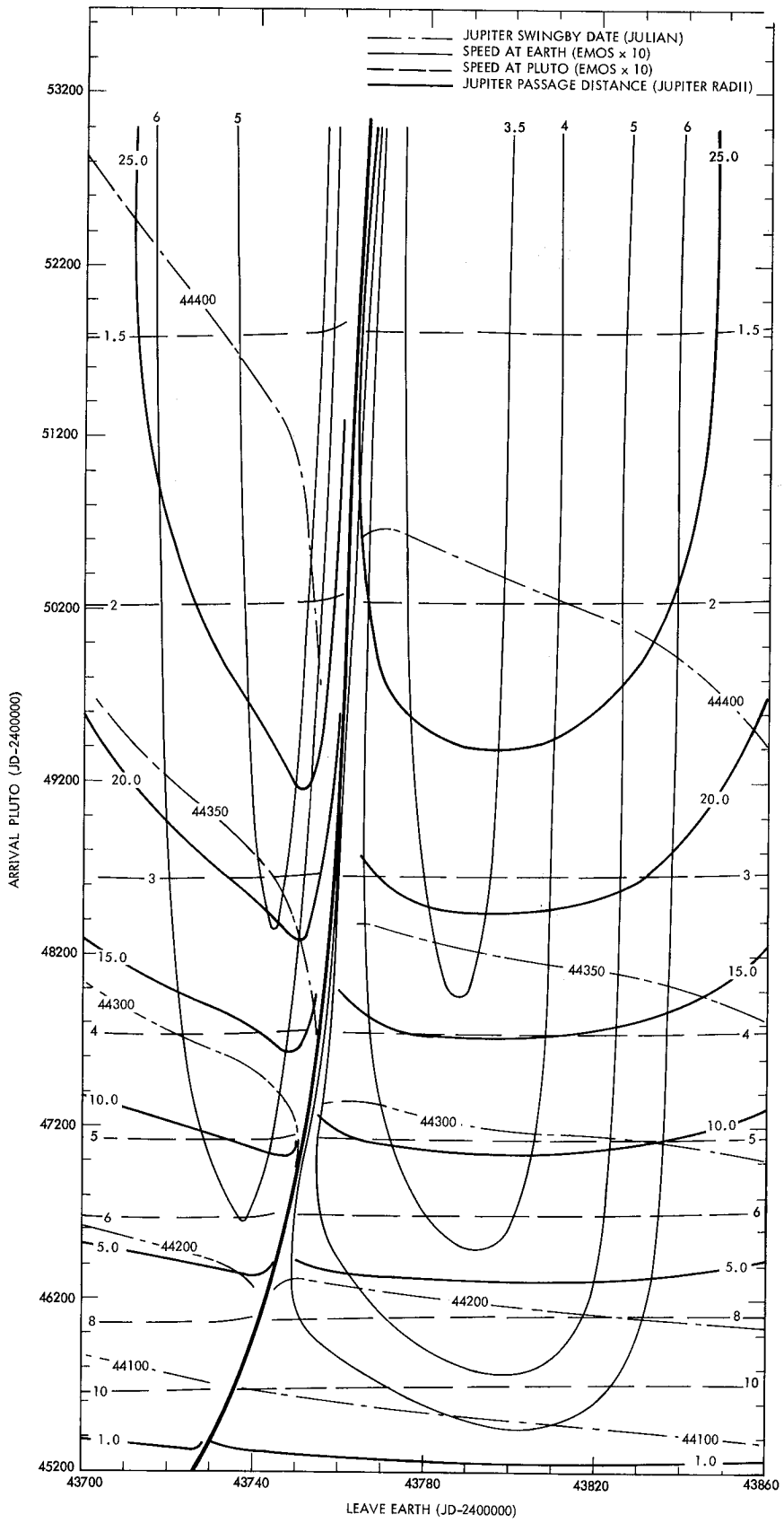

FIGURE 3-18 PLUTO MISSIONS USING JUPITER SWINGBY (1978)

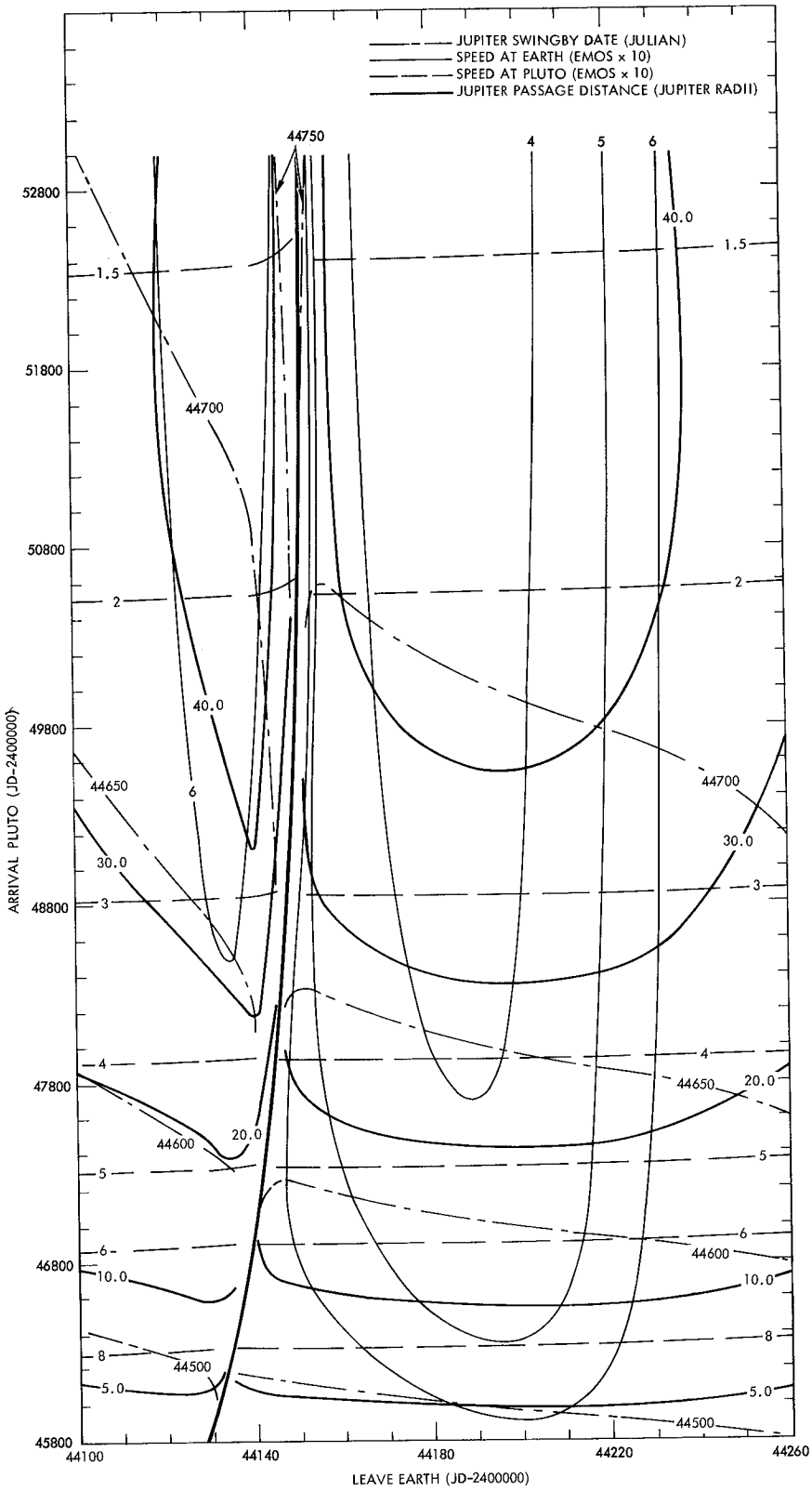

FIGURE 3-19 PLUTO MISSIONS USING JUPITER SWINGBY (1979)

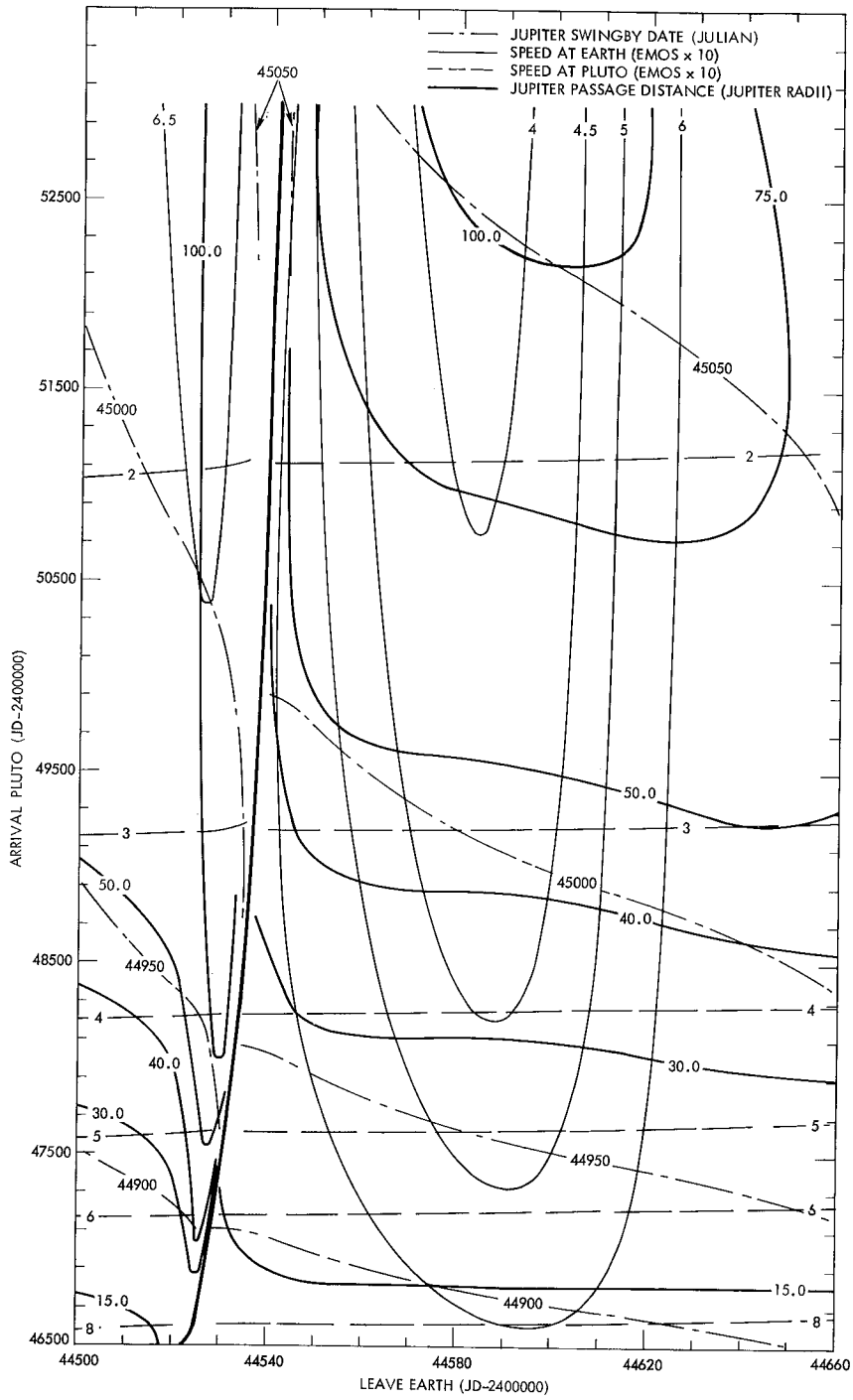

FIGURE 3-20 PLUTO MISSIONS USING JUPITER SWINGBY (1980)

Section 4

MULTIPLANET SWINGBY MISSION CONTOUR CHARTS

The graphical trajectory data for the 1976-1980 outer planet grand tour missions are presented in this section. There are a total of 20 charts, with 4 charts for each launch year. The coordinate axes of each chart are Earth departure date and Neptune arrival date. The first chart of each set of 4 contains contours of constant **Earth departure** excess speed and Neptune arrival excess speed. The three remaining charts repeat the Earth departure excess speed contours of the first chart and overlay contours of constant periapsis radius and swingby date for Jupiter, Saturn, and Uranus, respectively. The 180^{o} transfer ridge, denoted by the heavy solid line running diagonally up each chart, applies to the Earth-Jupiter transfer leg. All graphical data for those missions in a particular launch year which would impact the surface of one of the swingby planets are omitted. The 1.0 periapsis radius contour which establishes this limit in a particular launch year is drawn on each of the four charts of that launch year.

The comments in Section 1 and Section 3 concerning Jupiter swingby missions can, in general, be applied to these missions. In fact, the grand tour can be defined as an Earth-Jupiter-Saturn single-planet swingby in which the arrival at Saturn, instead of being unconstrained, is adjusted to achieve the post-encounter conditions required for a trajectory to Uranus. A comparison of the Earth departure excess speed contours in this section with the contours in Section 3 for single-planet swingbys to Saturn substantiate this relationship. This would imply that most Jupiter swingbys to Saturn in this time period could be extended into grand tour missions.

The grand tour missions of practical interest will be those which minimize the flight time to Neptune; the data contained in the contour charts applies to these "short" flight time missions. The flight times shown vary from about 8 years to an arbitrarily imposed limit of about 25 years. The Earth departure energy requirements which result reflect the requirements of the short flight time Earth-Jupiter-Saturn single-planet swingby missions. Thus the most

favorable grand tour launch opportunity (in terms of departure energy) is 1976.* The departure requirements increase throughout the remaining launch years, the 1980 departures exhibiting the most severe departure energy requirements.

Two restrictions on the radius of the Saturn encounter hyperbola have the greatest effect on the characteristics of the grand tour missions. The first restriction is that the periapsis radius be greater than one planet radii; the second concerns avoiding the rings of Saturn. Considering the first restriction, as can be seen in the figures which follow, the periapsis radius at Saturn encounter establishes the minimum possible flight time to Neptune. This is the case in all launch opportunities, although for 1976 launches, the periapsis radius at Jupiter constrains the flight time across most of the departure window. The minimum flight time for all launch years occurs in 1979 and is about 7.8 years although the minimum flight time for departures in 1978 is almost as short. This flight time is only about 450 days longer than the best single-planet swingbys to Neptune occuring during this time period but is about 9 years shorter than a direct transfer of equivalent energy.

Although it is not indicated on the contours, the planetocentric radius at which the Saturn encounter hyperbola intersects the equatorial plane is a critical parameter in determing mission feasibility.** The rings of Saturn lie in the equatorial plane of the planet at distances from about 1.2 planet radii to 2.3 planet radii. Present estimates of the composition of the rings indicate that a spacecraft will be unable to successfully penetrate this satellite system. Thus only those missions are possible for which the periapsis radius at Saturn exceeds 2.3 radii or for which the radius of equatorial intersection of the encounter hyperbola is less than about 1.2 planet radii. This effectively limits the available missions to a narrow "window" of minimum flight time missions passing close to the surface of Saturn and a region of long flight time missions passing outside the rings. The shortest flight time for missions passing outside the Saturn ring system is on the order of 10.5 years.

The periapsis distances at Jupiter and Uranus also exert an influence on these missions; however, with the exception of launches in 1976, the influence is

*Missions are also available in the 1975 launch opportunity; however, they are characterized by long flight times and narrow launch windows.

**This parameter is given in the tabular data contained in the Supplement to this volume.

not in the restrictive manner of the periapsis radius at Saturn. The periapsis radius at Jupiter increases markedly with increasing launch year, following the same trend as in the single-planet swingby missions to Saturn. The minimum periapsis radius increases from about 1 radius in 1976 to more than 30 radii for launches in 1979 and 1980. The periapsis radius at Uranus also increases with launch year but not as radically as does the perijove radius. These large passage distances at Jupiter (and Uranus) make the 1979 and 1980 launch opportunities rather unfavorable from the standpoint of effective planetary reconnaissance.

The heliocentric phases of these missions are generally characterized by low inclination, high energy (usually hyperbolic) transfer conics. The transfer legs are all Type I except certain transfers between Earth and Jupiter for which Type II legs also exist. The eccentricities of these transfer conics vary considerably. For all launch years the Earth-Jupiter transfers are usually high eccentricity ellipses, except for some of the short flight time missions which are hyperbolic. The Saturn-Uranus and Uranus-Neptune legs in the launch years 1976-1978 are all hyperbolic for the range of trip times included on these contour charts. These same legs, in 1979 and 1980, are hyperbolic in the flight time region of greatest interest but do become elliptical at flight times (to Neptune) of around 7000 days in 1979 and 6700 days in 1980. The Jupiter-Saturn transfers are generally hyperbolic at the shorter flight times and progressively decrease in eccentricity as flight time is increased. They become elliptical at mission times ranging from about 5200 days (1976 launches) to about 3100 days (1980 launches).

The approach and encounter conditions at Jupiter are the same as those described in Section 3 for the single-planet swingby missions to Saturn. For the remaining planets, the approach to the planet is from the lightside with, in general, a darkside periapsis. The encounters, at all the planets, are posigrade (trailing edge) except at Jupiter for launches in 1980. Technically, the passages at Uranus are also retrograde (due to Uranus' high obliquity); however, the passages are behind the trailing edge of the planet as viewed from the Sun and would normally be classed as posigrade.

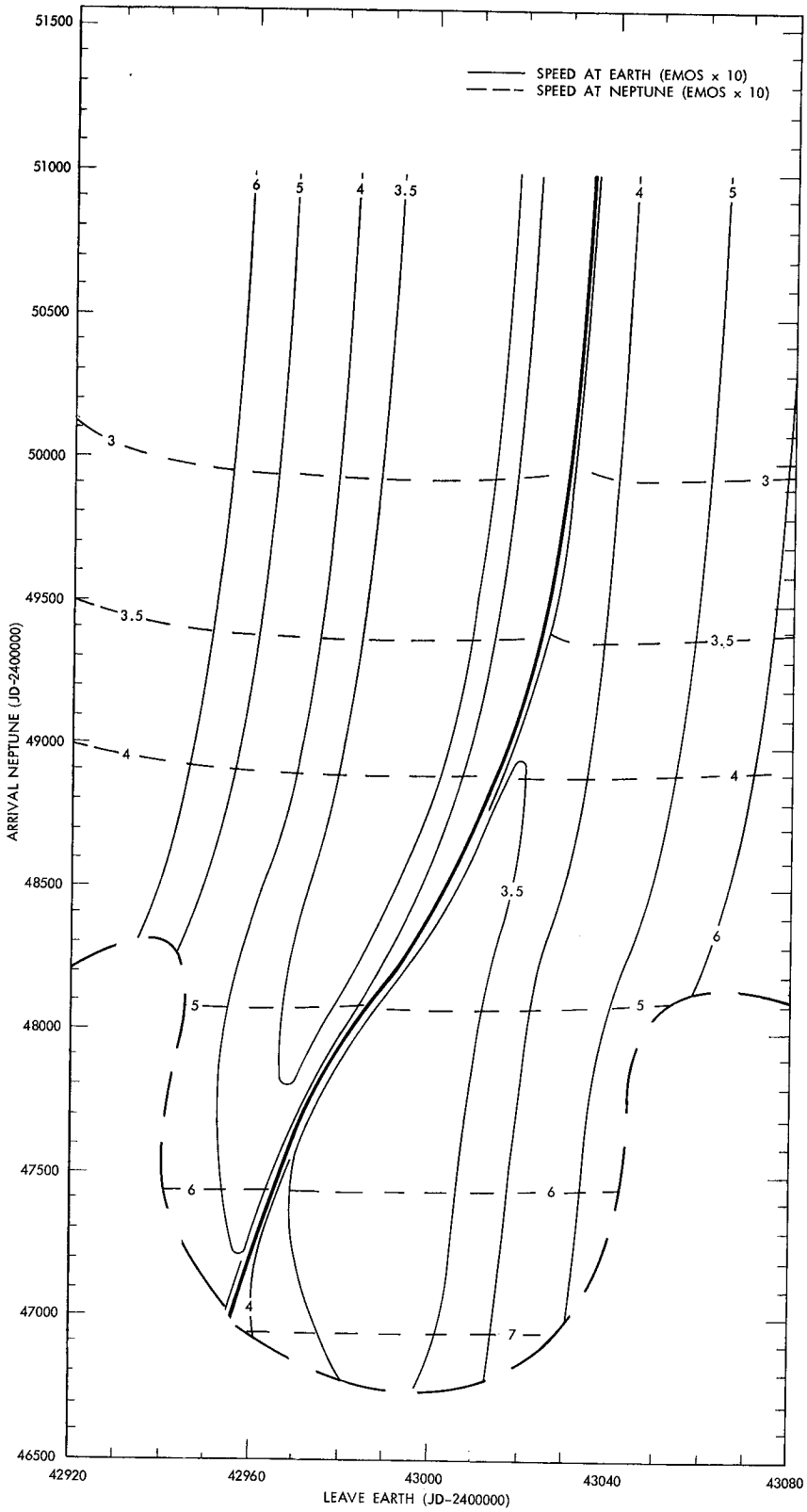

FIGURE 4-1a OUTER PLANET GRAND TOUR (1976)

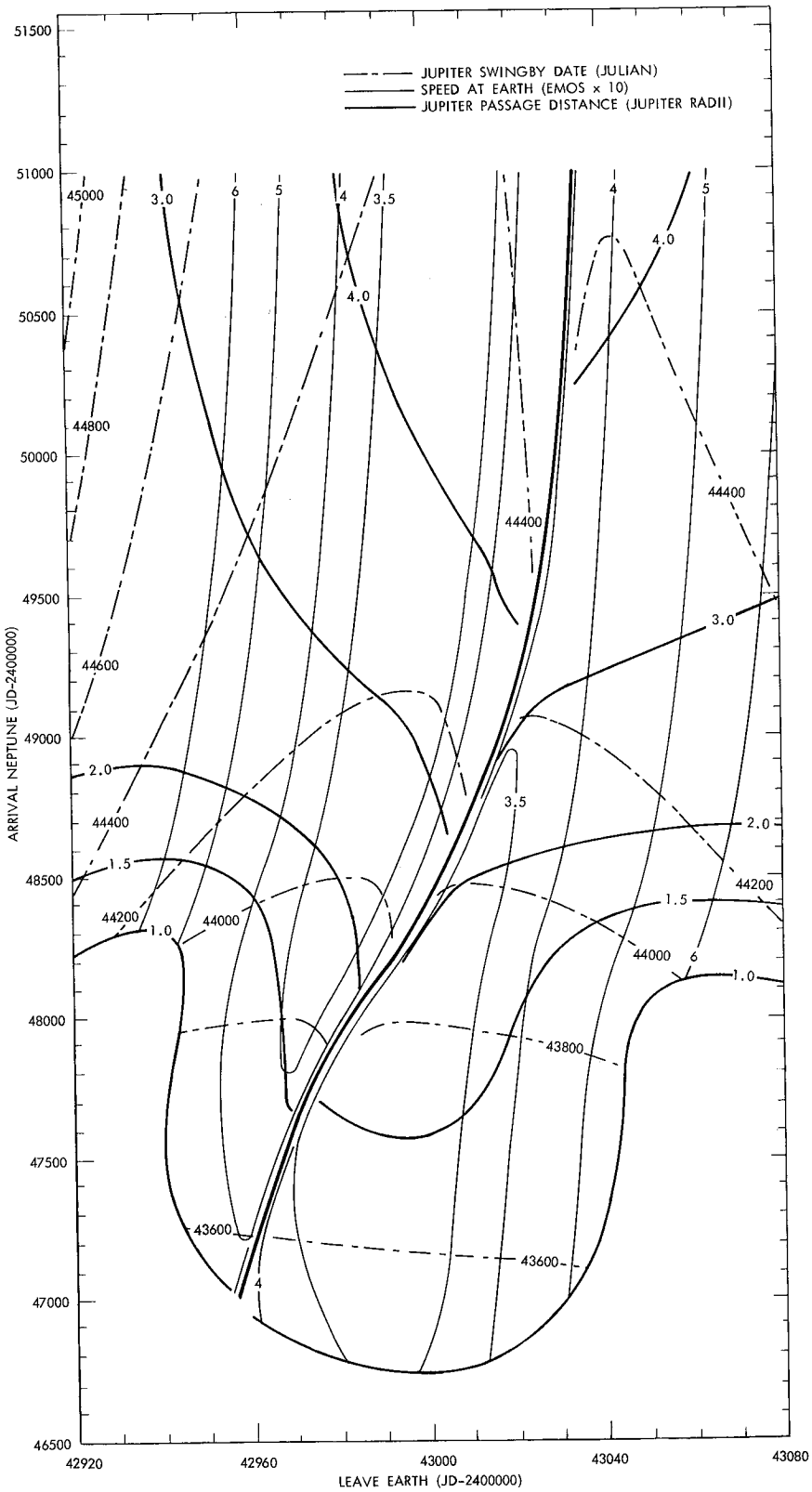

FIGURE 4-1b OUTER PLANET GRAND TOUR-JUPITER ENCOUNTER (1976)

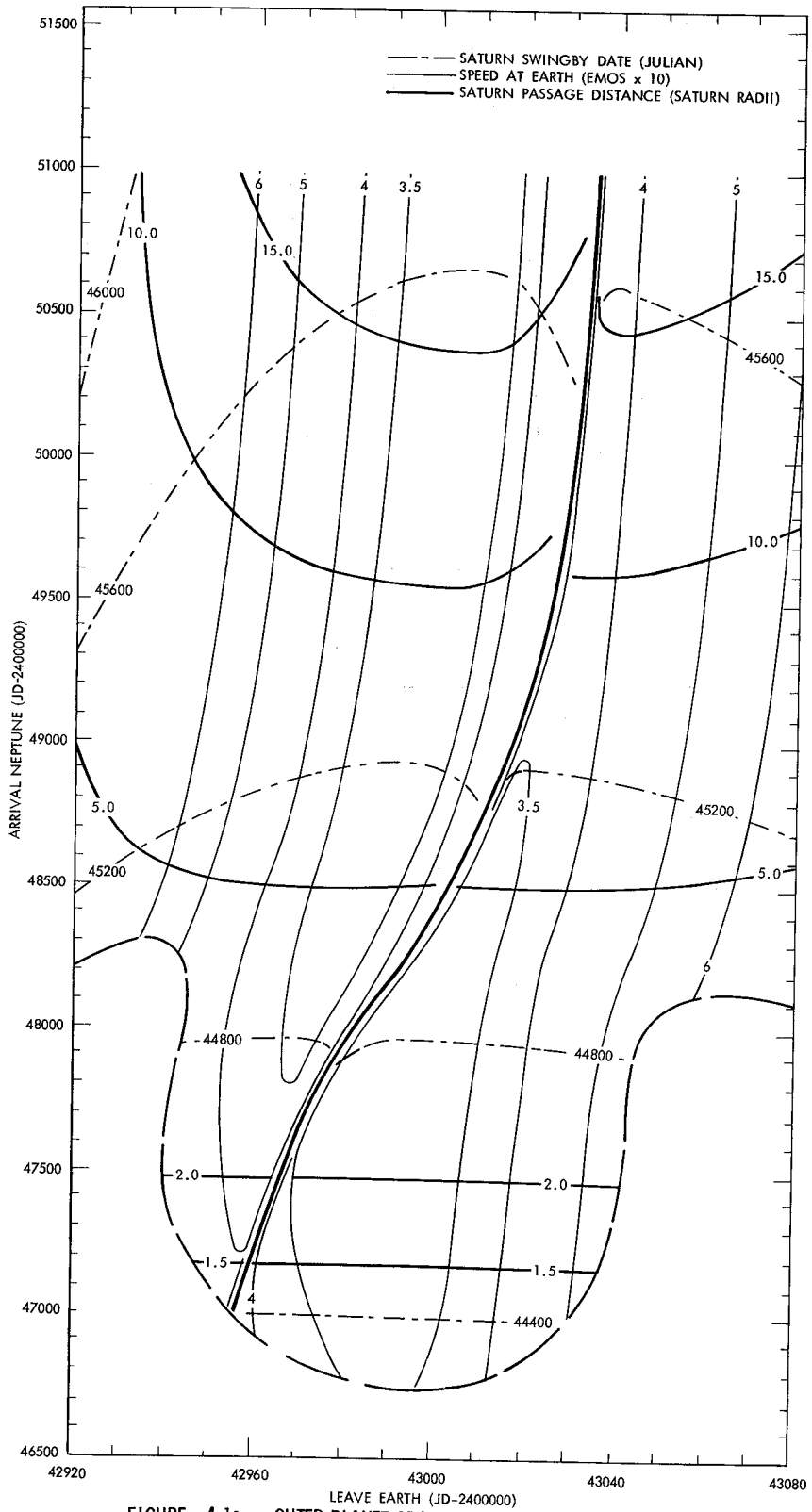

FIGURE 4-1c OUTER PLANET GRAND TOUR-SATURN ENCOUNTER (1976)

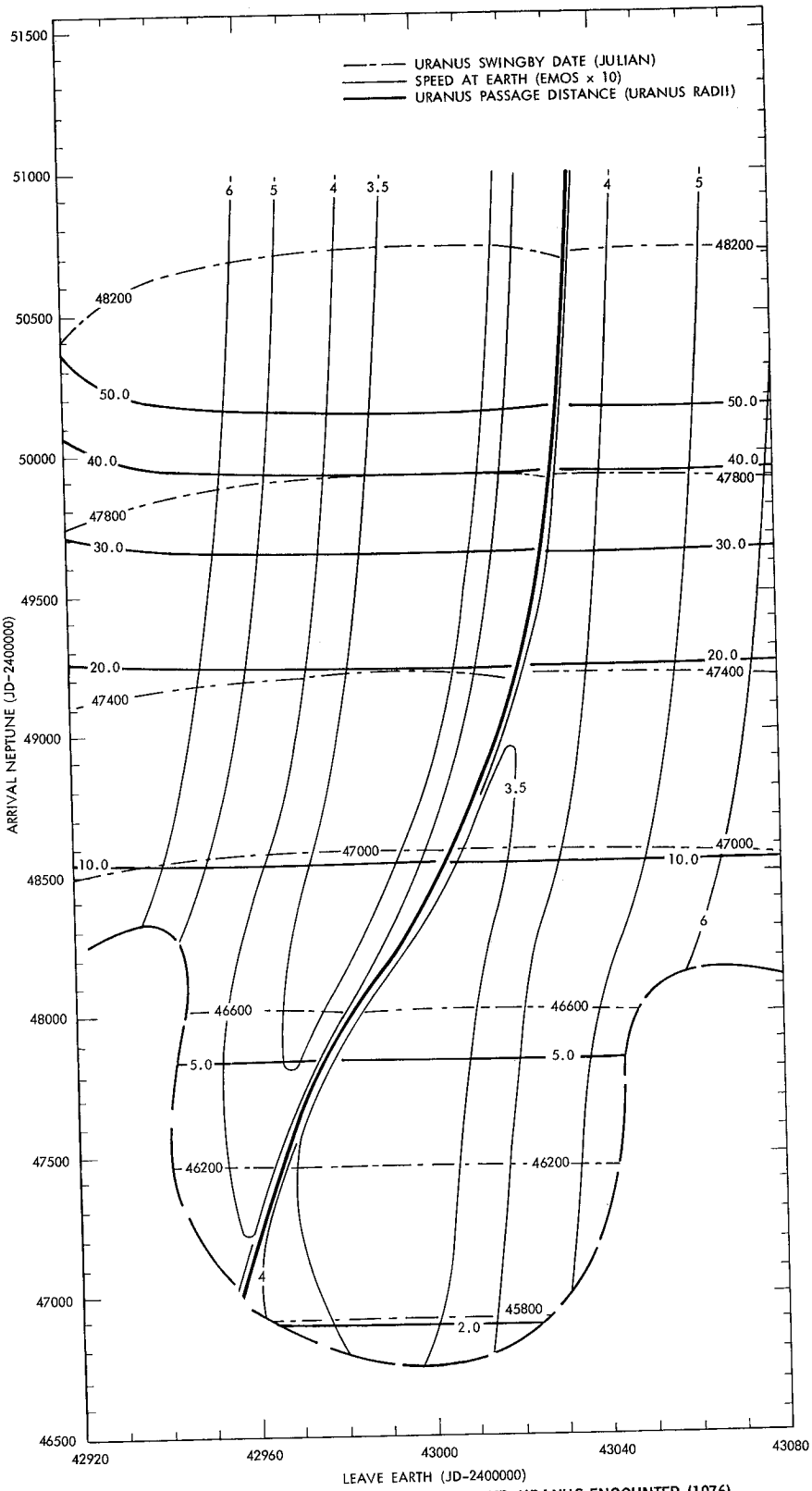

FIGURE 4-1d OUTER PLANET GRAND TOUR-URANUS ENCOUNTER (1976)

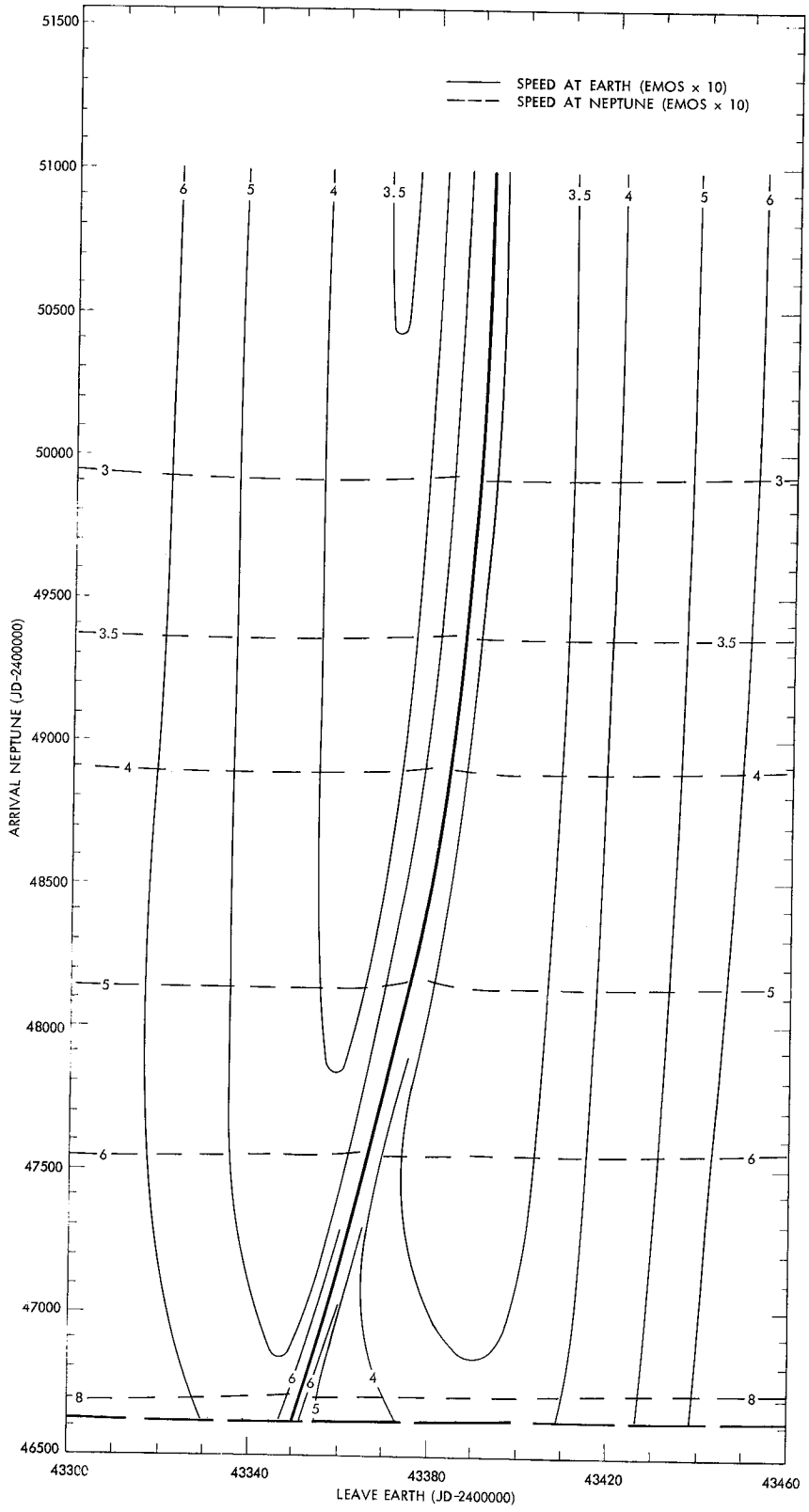

FIGURE 4-2a OUTER PLANET GRAND TOUR (1977)

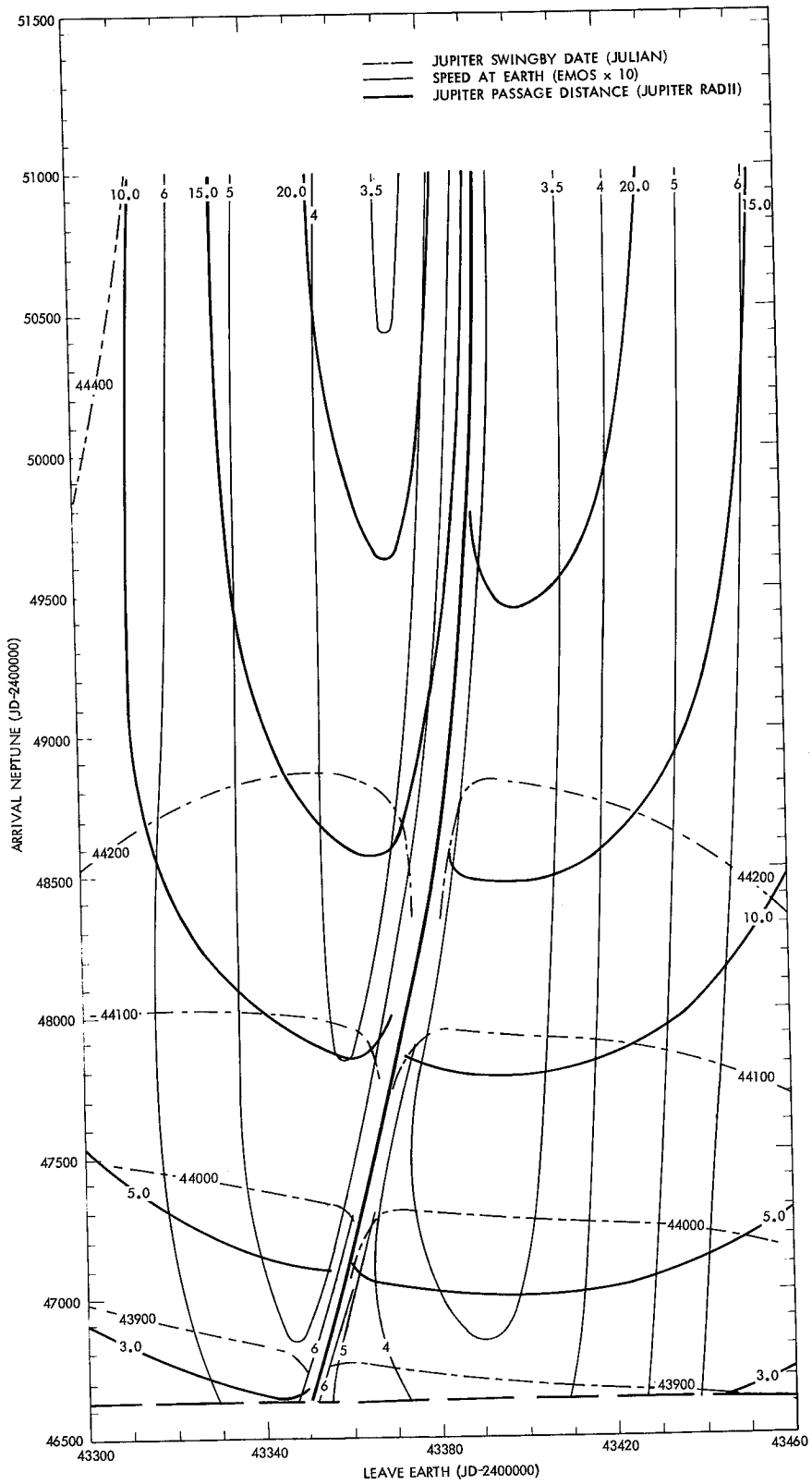

FIGURE 4-2b OUTER PLANET GRAND TOUR-JUPITER ENCOUNTER (1977)

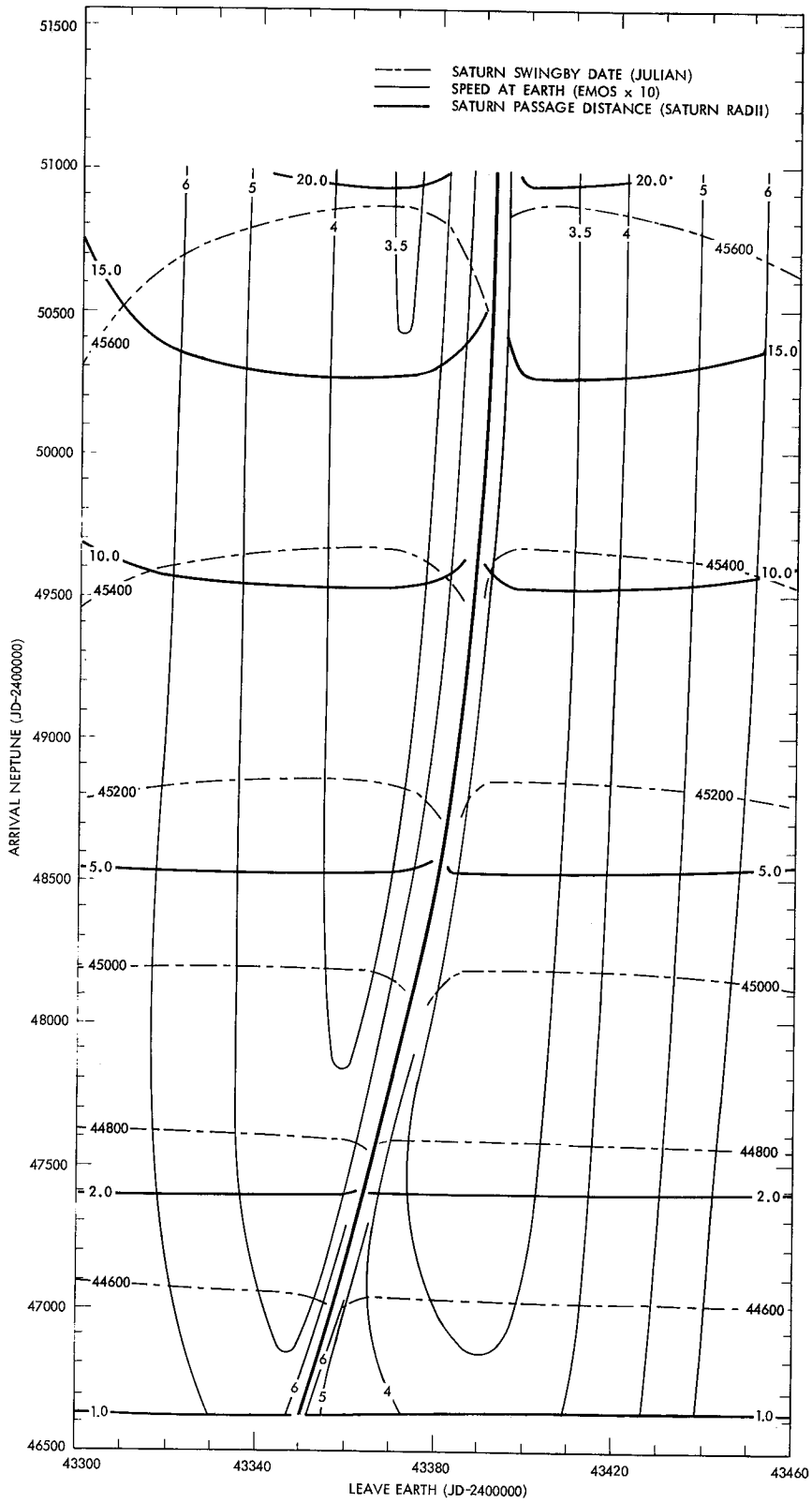

FIGURE 4-2c OUTER PLANET GRAND TOUR-SATURN ENCOUNTER (1977)

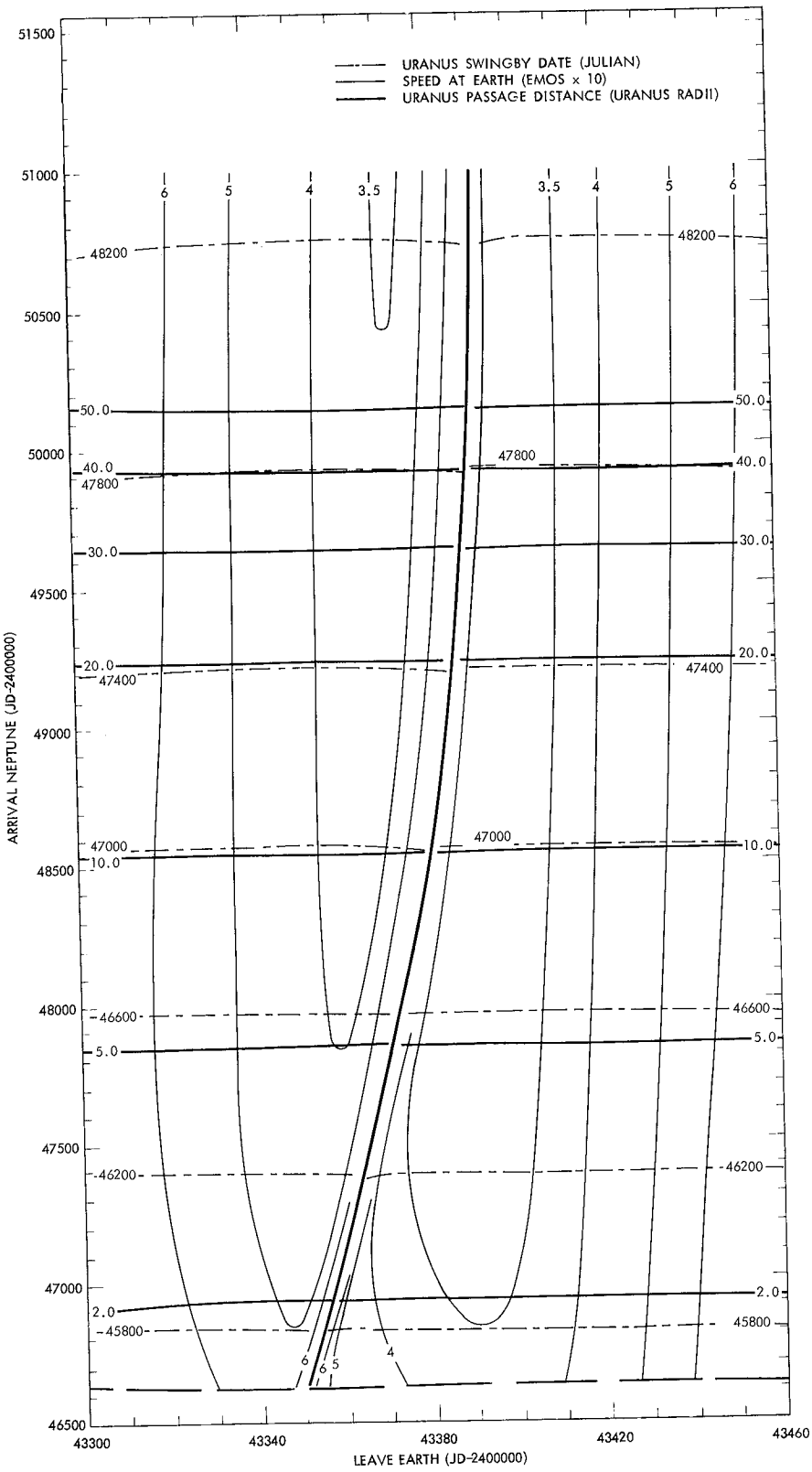

FIGURE 4-2d OUTER PLANET GRAND TOUR-URANUS ENCOUNTER (1977)

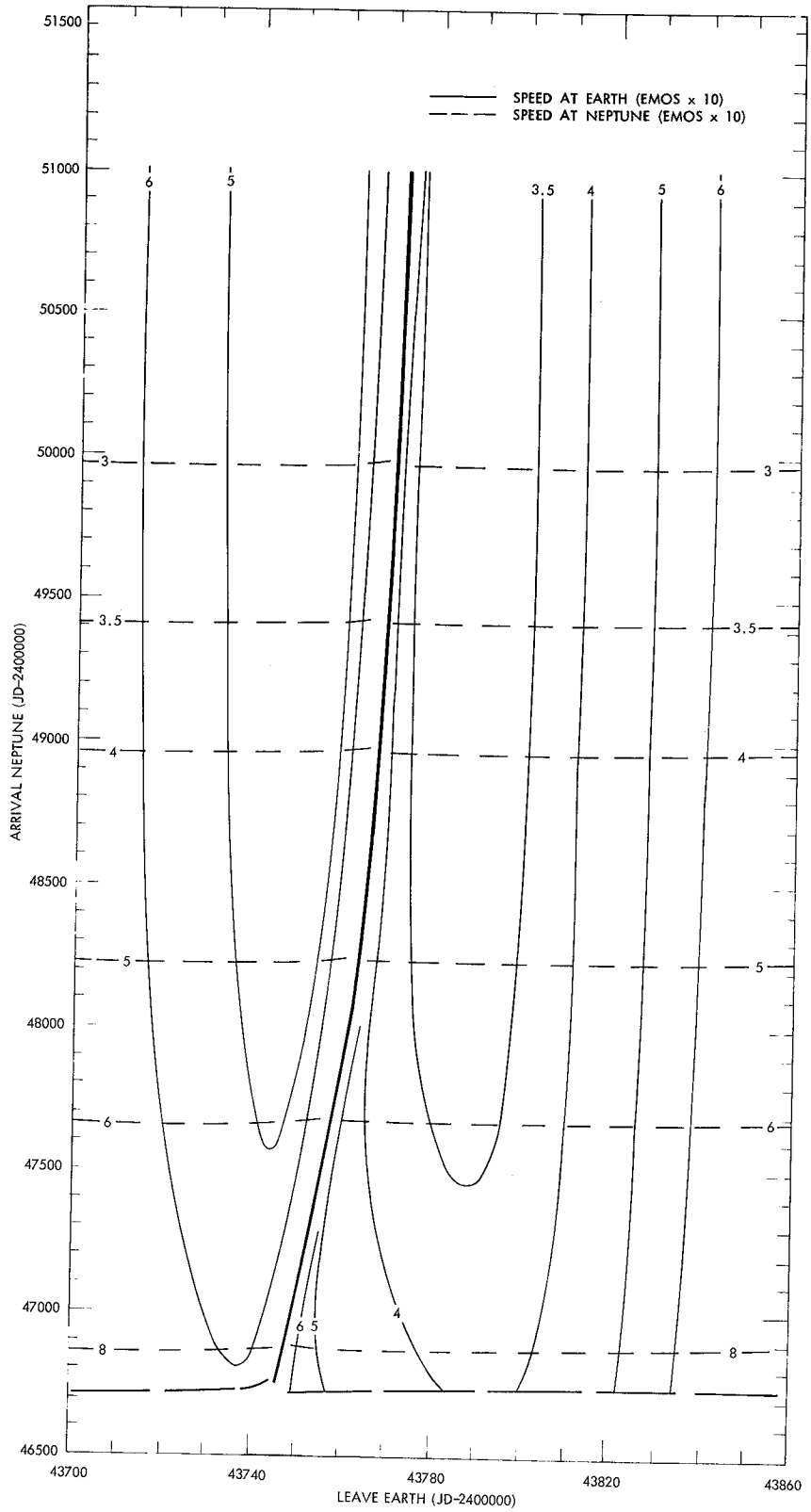

FIGURE 4-3a OUTER PLANET GRAND TOUR (1978)

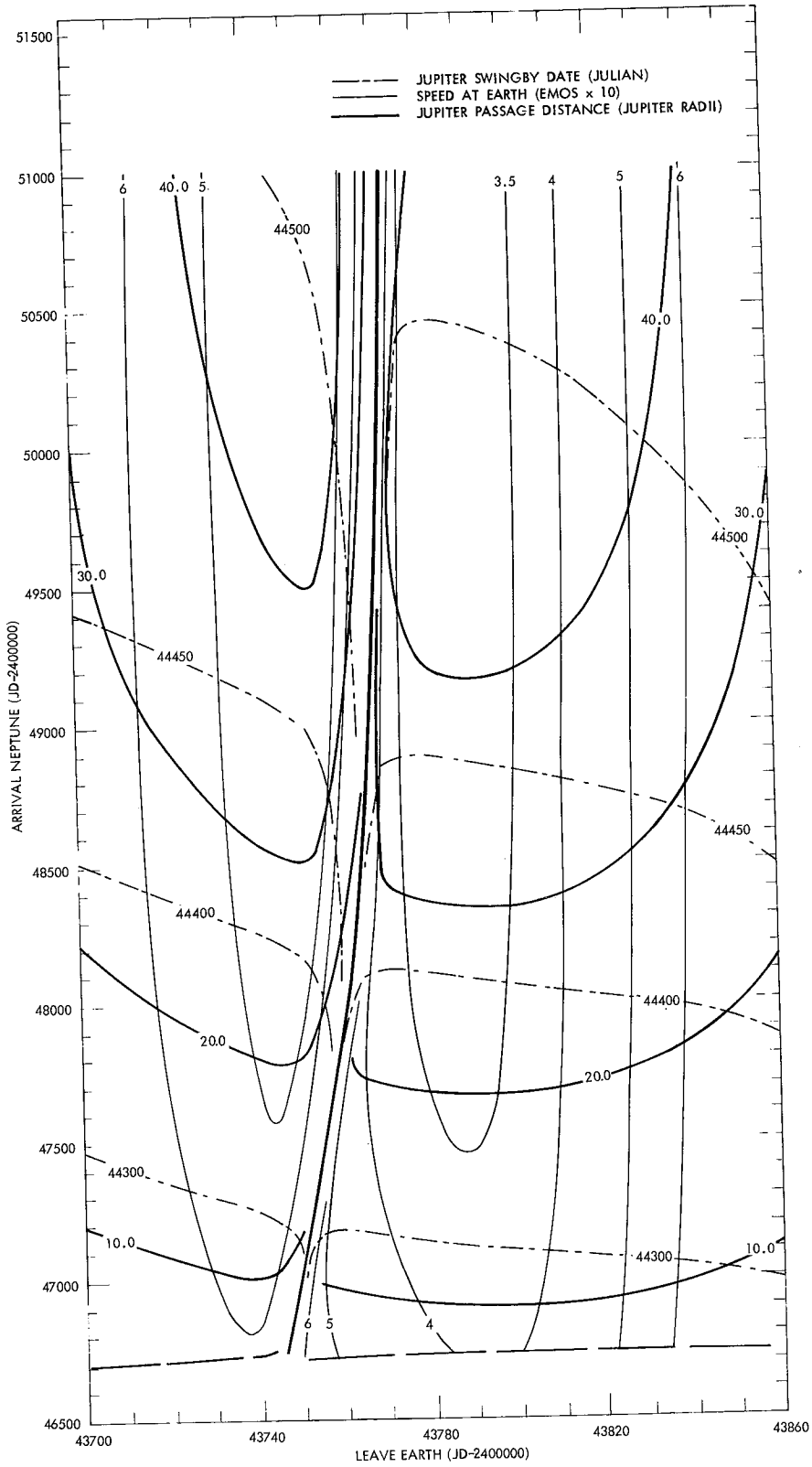

FIGURE 4-3b OUTER PLANET GRAND TOUR-JUPITER ENCOUNTER (1978)

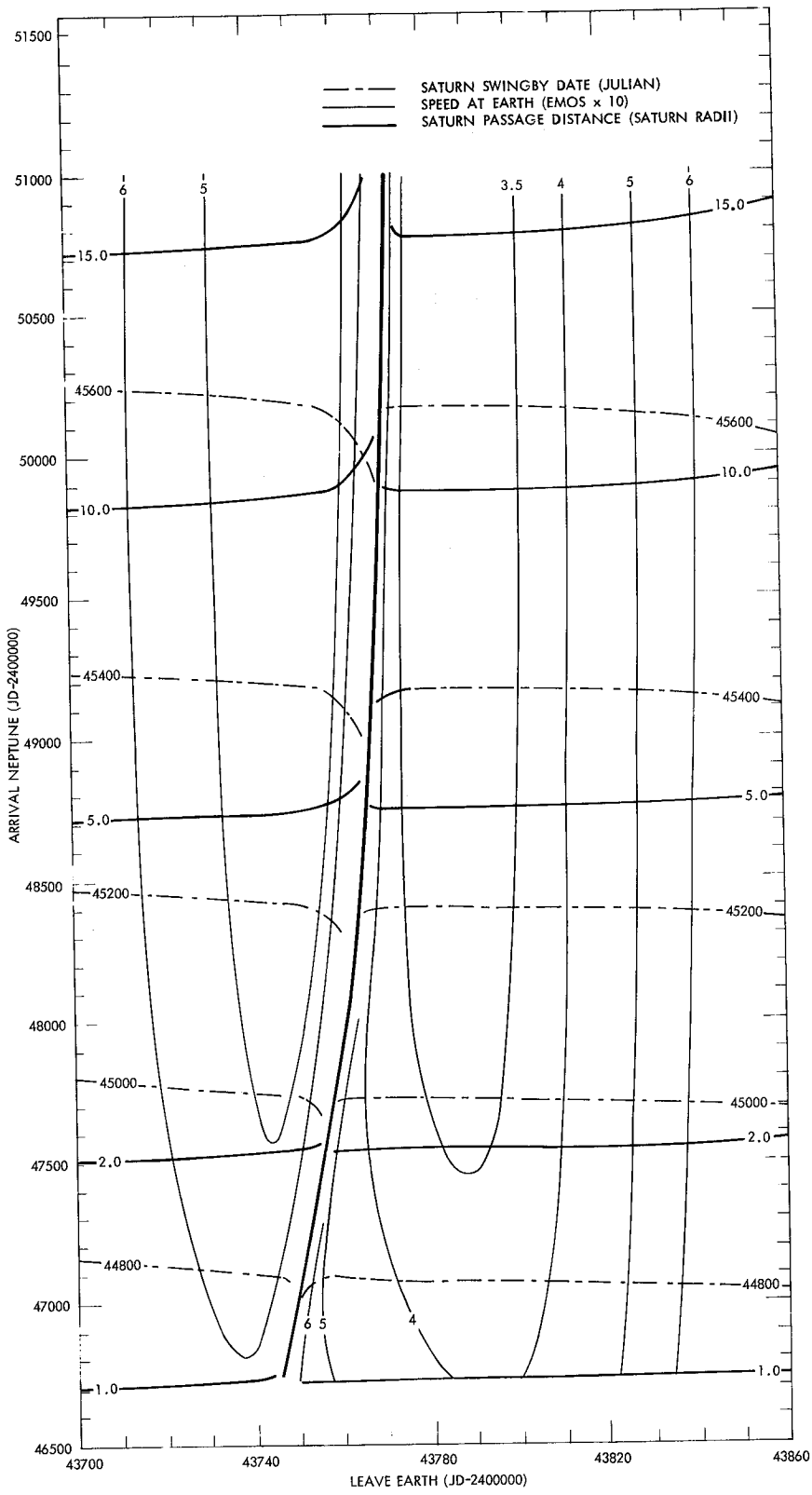

FIGURE 4-3c OUTER PLANET GRAND TOUR-SATURN ENCOUNTER (1978)

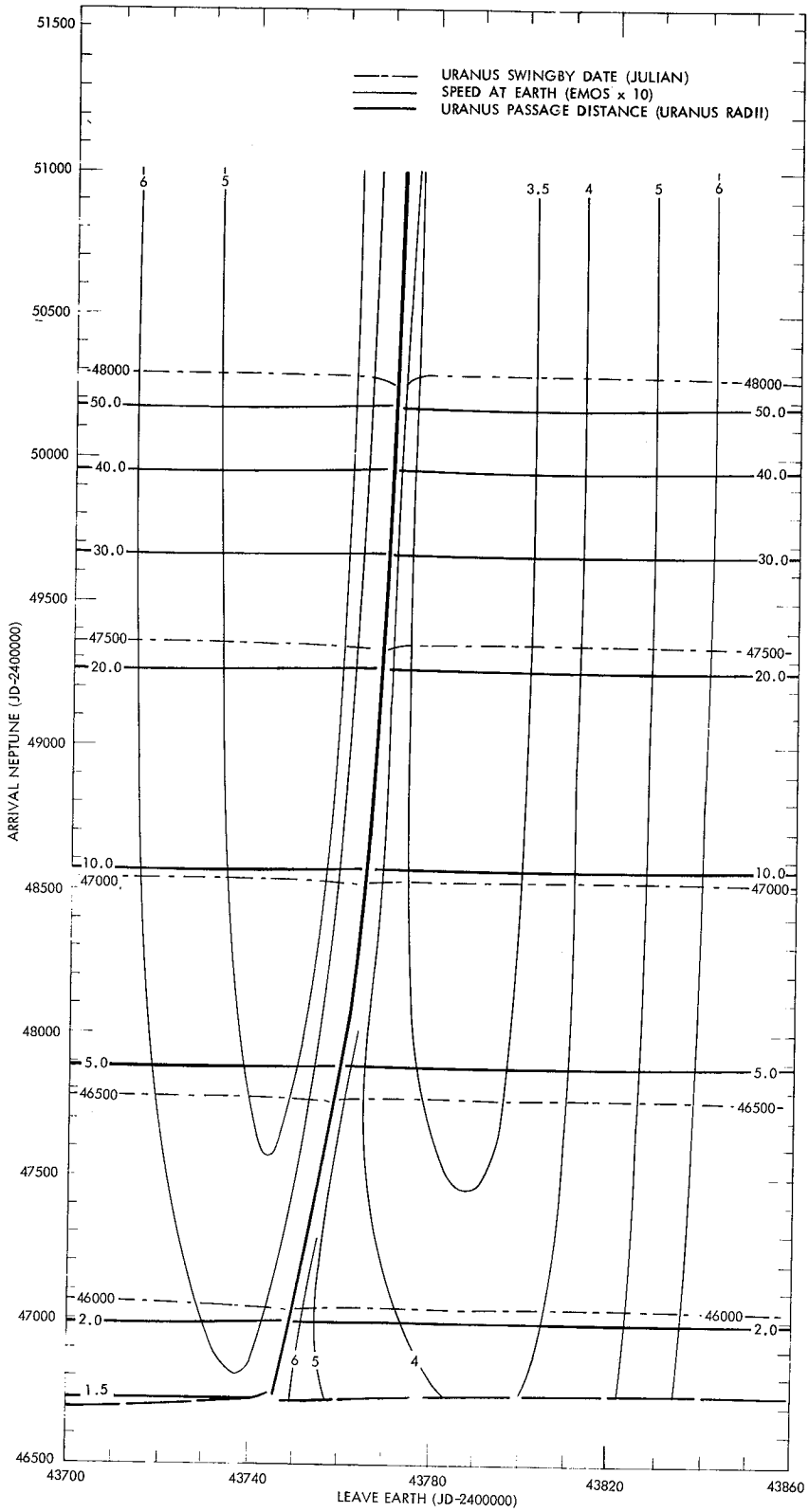

FIGURE 4-3d OUTER PLANET GRAND TOUR-URANUS ENCOUNTER (1978)

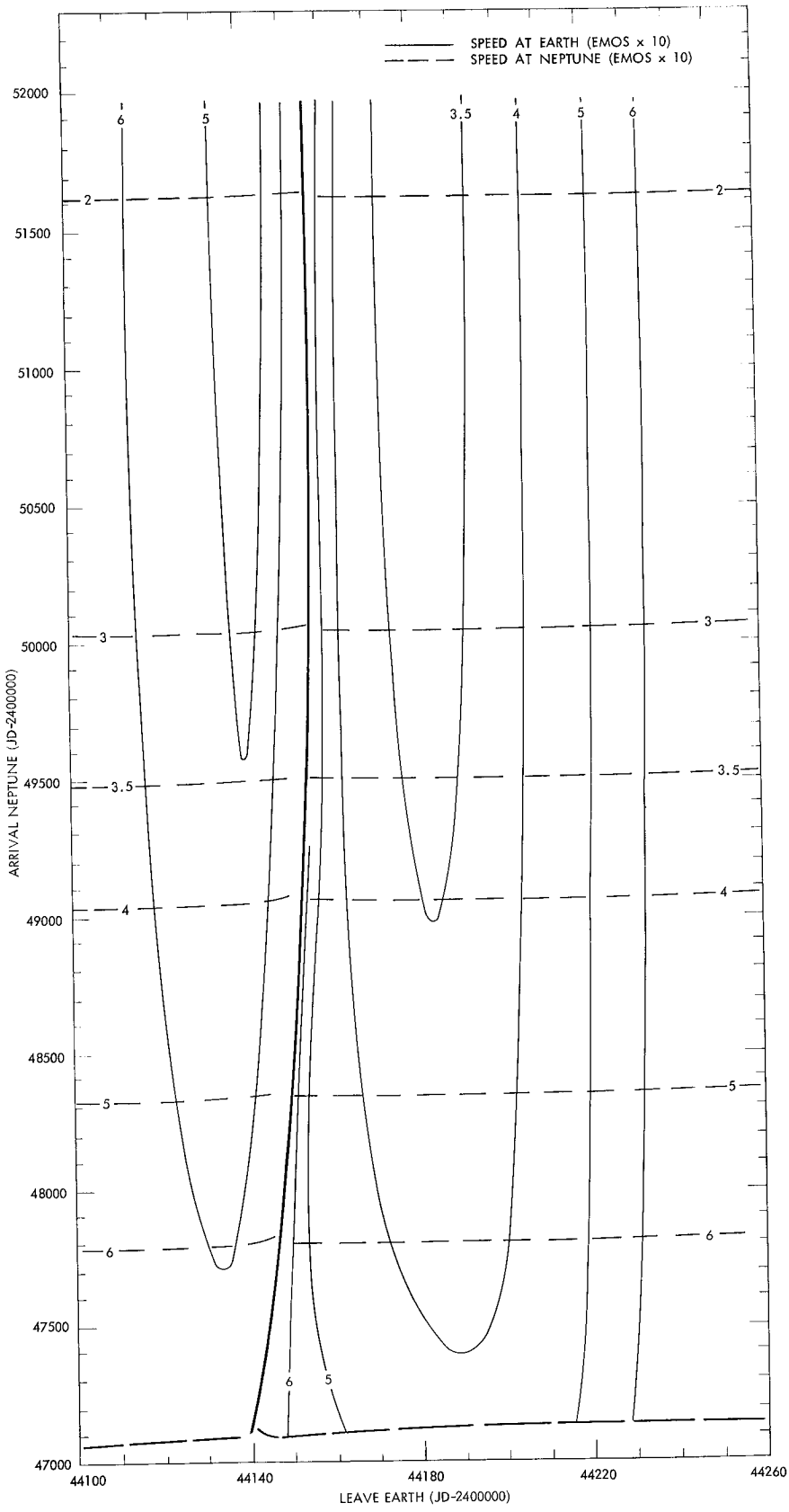

FIGURE 4-4a OUTER PLANET GRAND TOUR (1979)

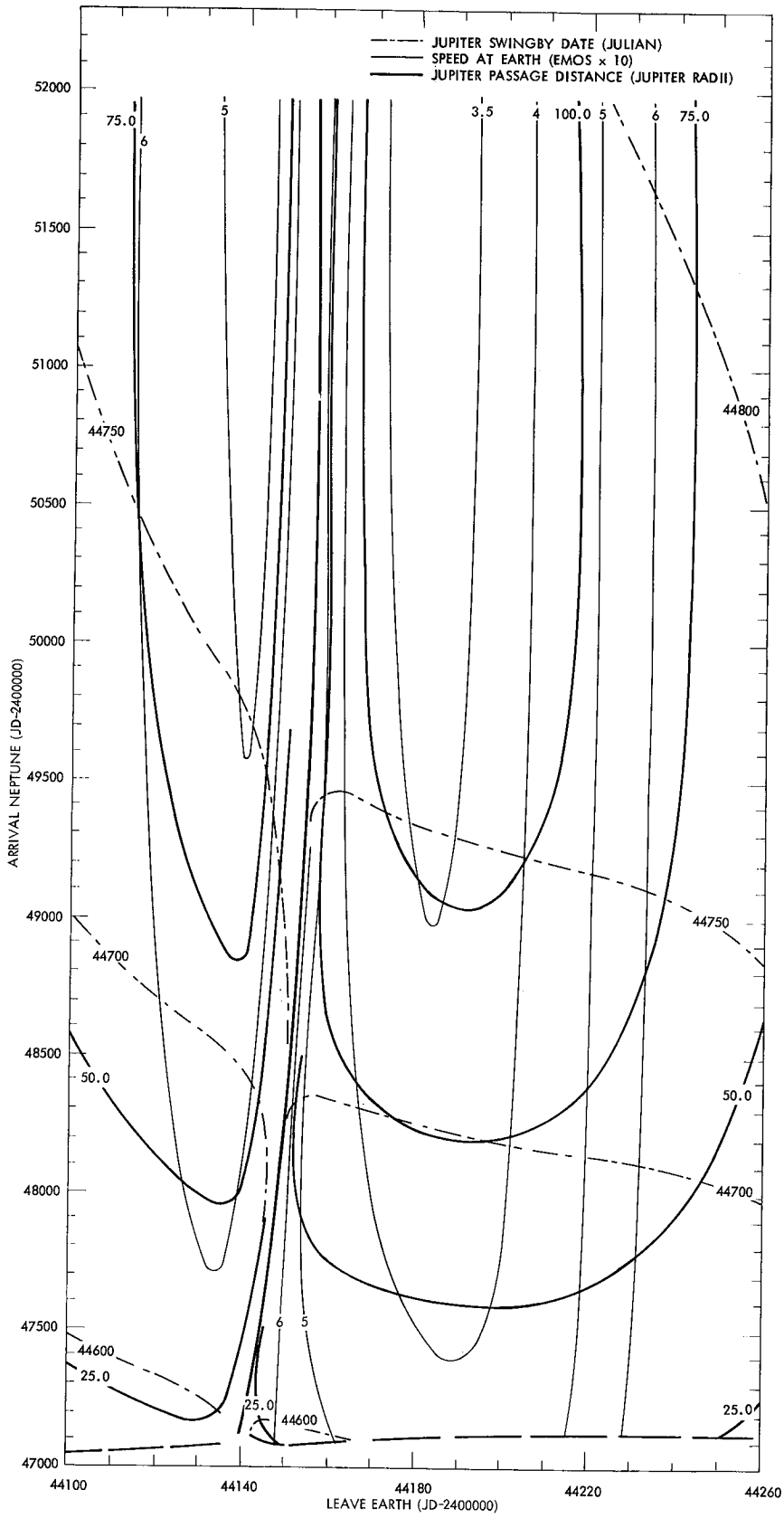

FIGURE 4-4b OUTER PLANET GRAND TOUR-JUPITER ENCOUNTER (1979)

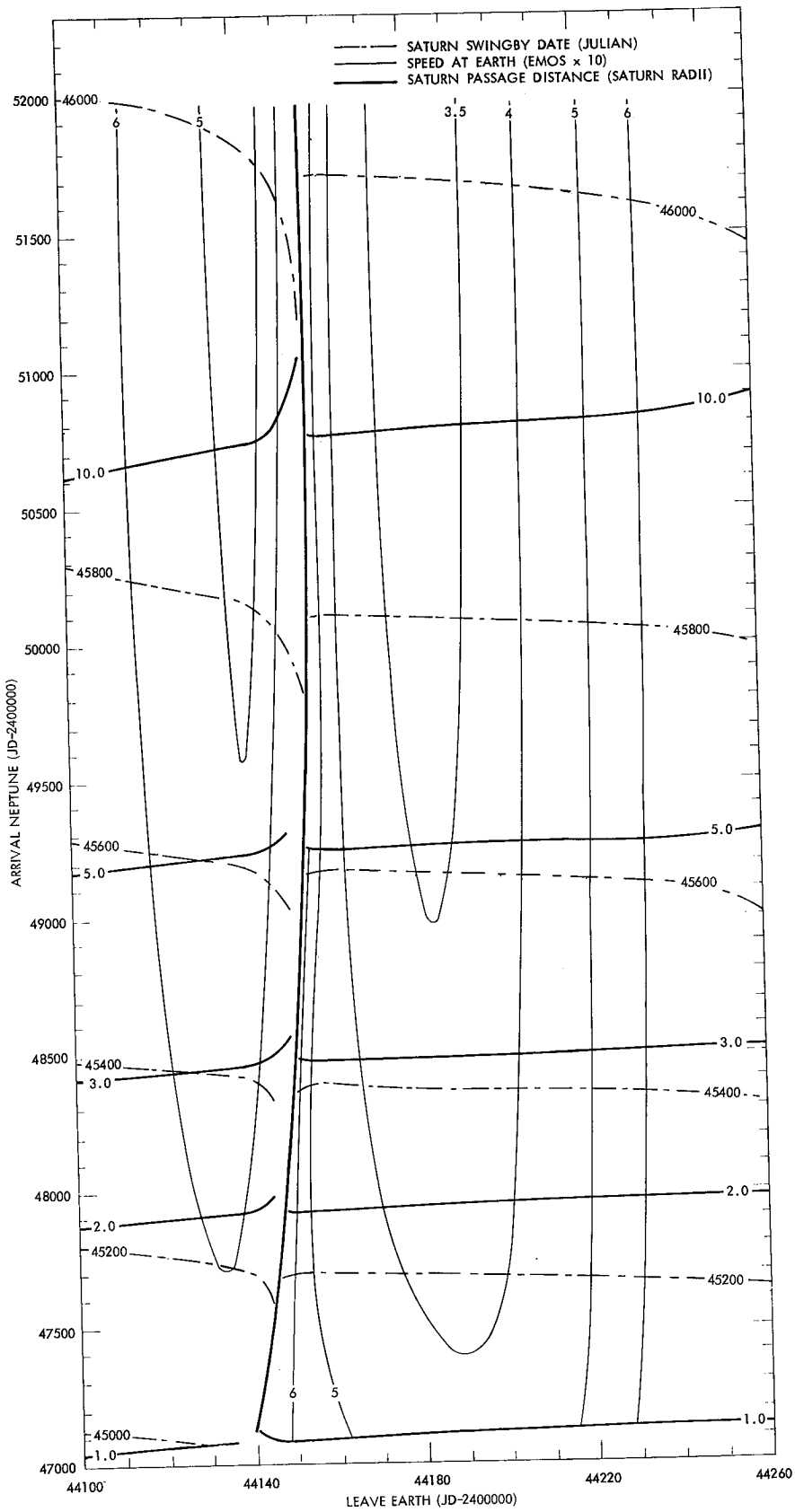

FIGURE 4-4c OUTER PLANET GRAND TOUR-SATURN ENCOUNTER (1979)

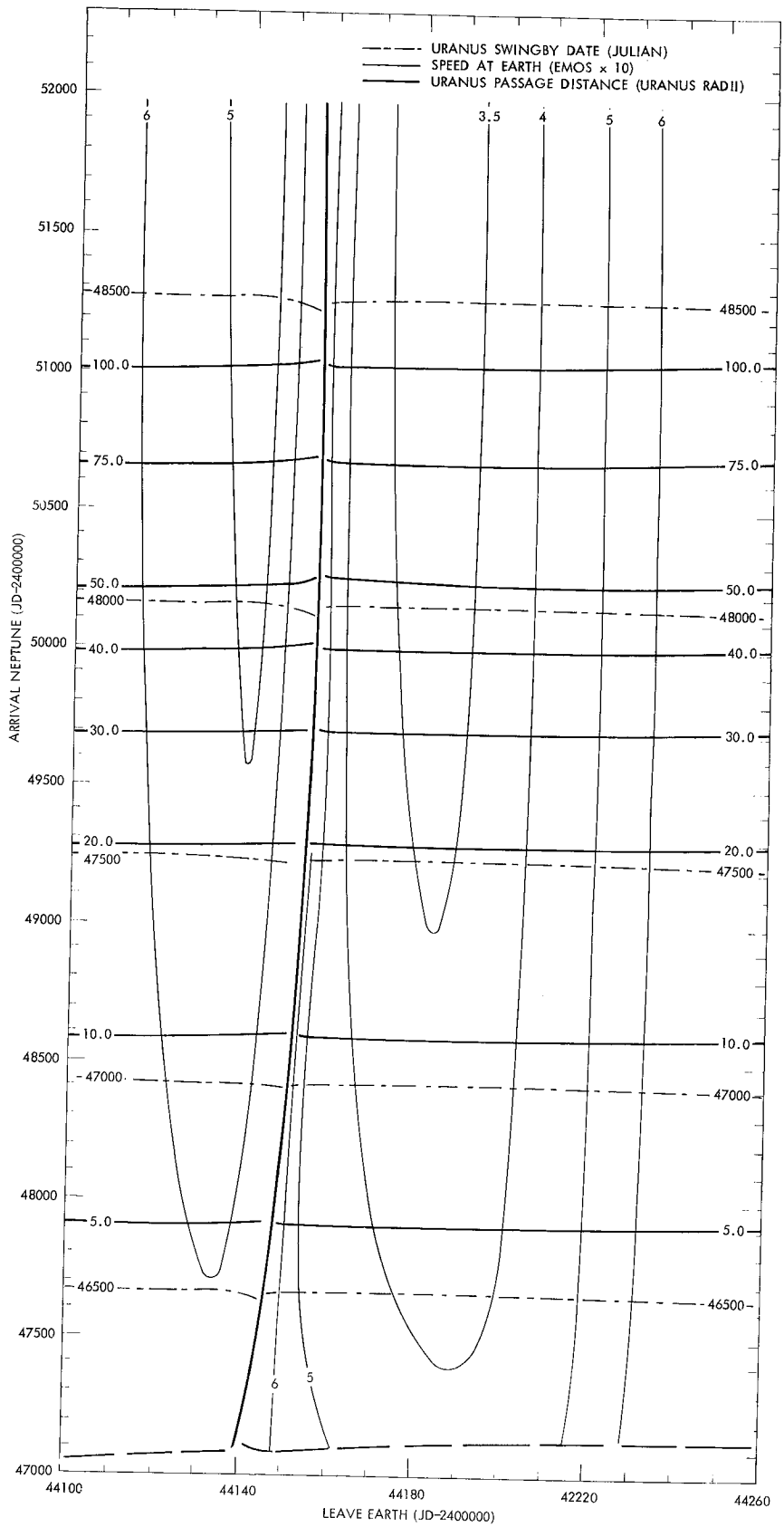

FIGURE 4-4d OUTER PLANET GRAND TOUR-URANUS ENCOUNTER (1979)

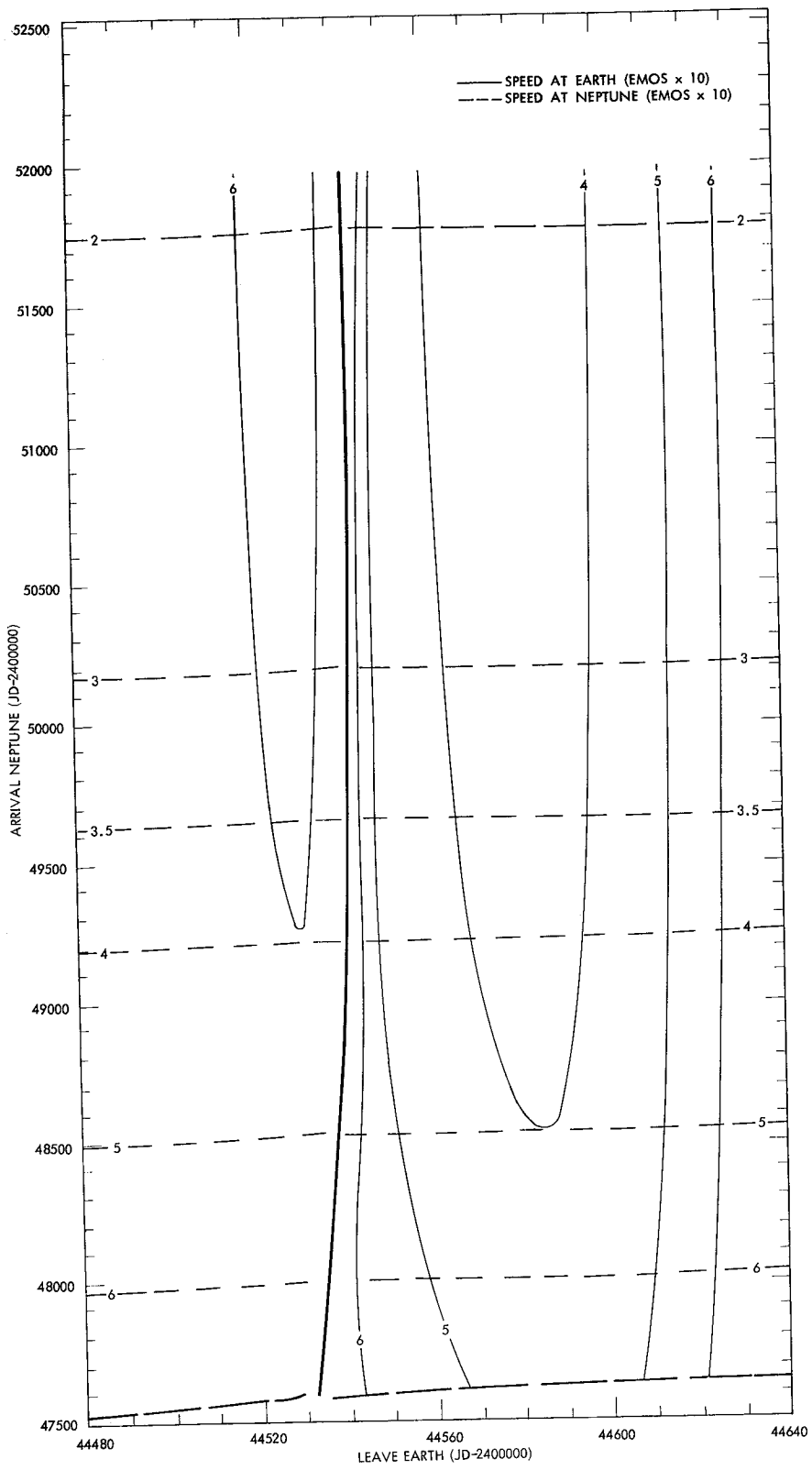

FIGURE 4-5a OUTER PLANET GRAND TOUR (1980)

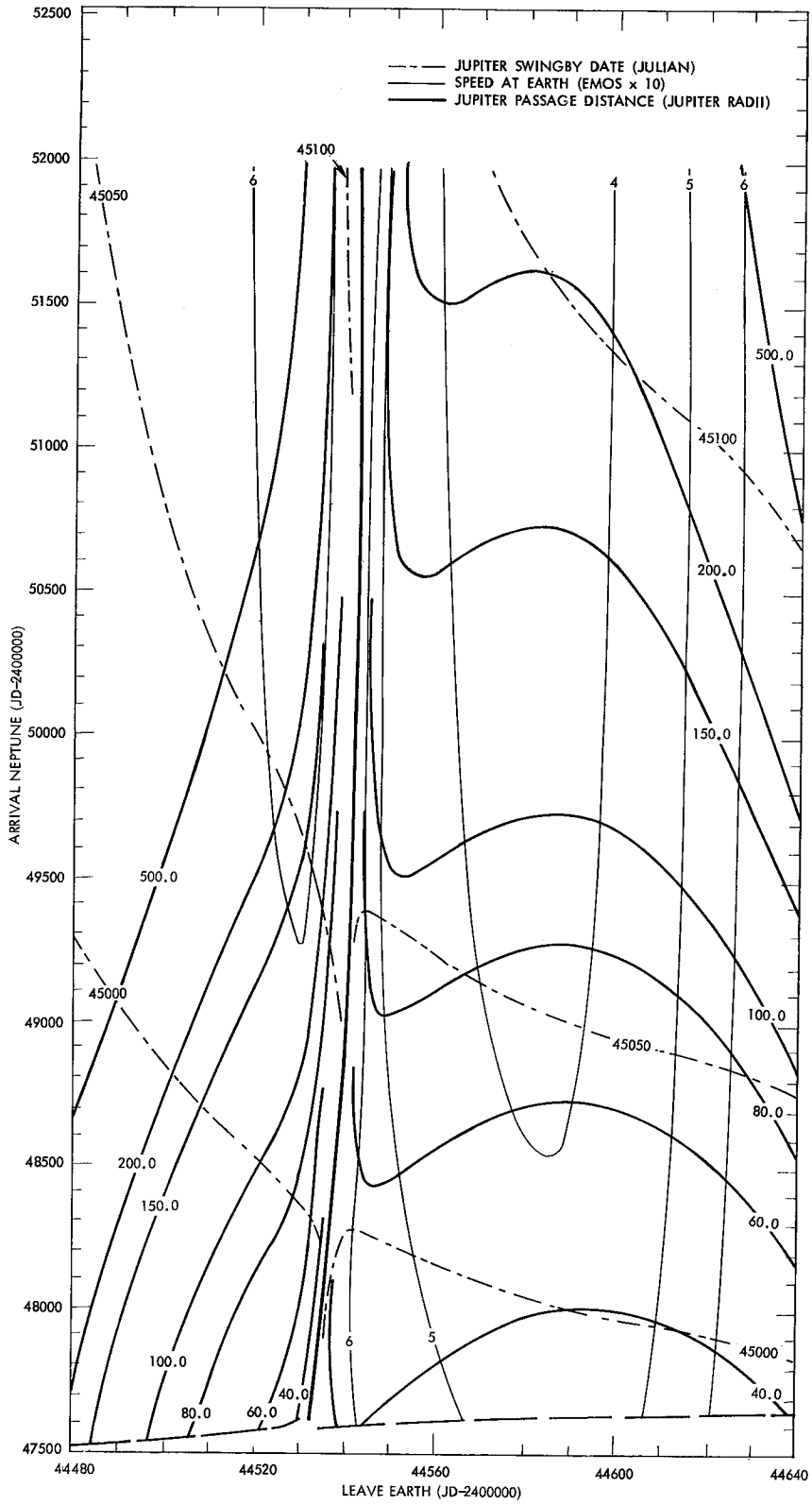

FIGURE 4-5b OUTER PLANET GRAND TOUR-JUPITER ENCOUNTER (1980)

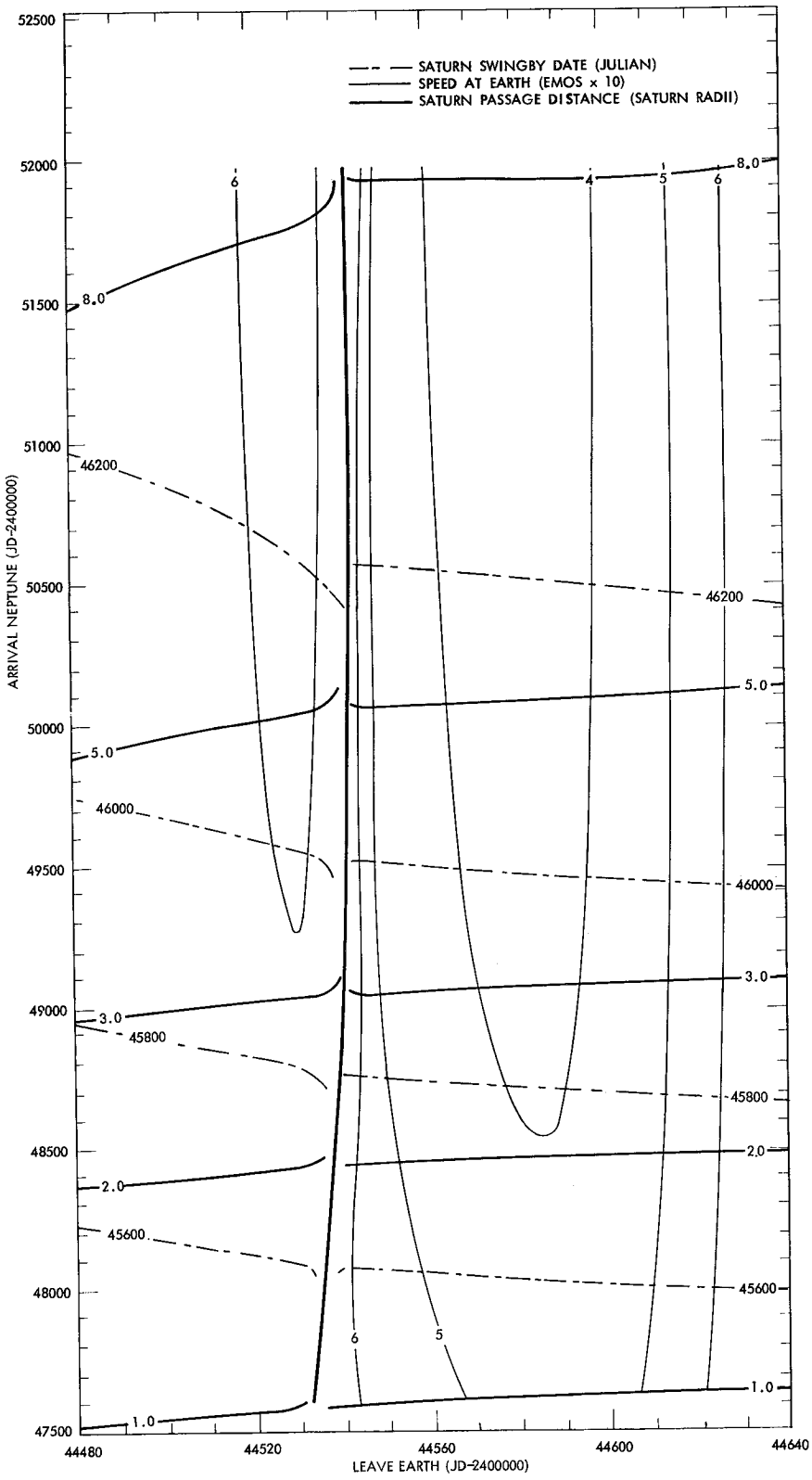

FIGURE 4-5c OUTER PLANET GRAND TOUR-SATURN ENCOUNTER (1980)

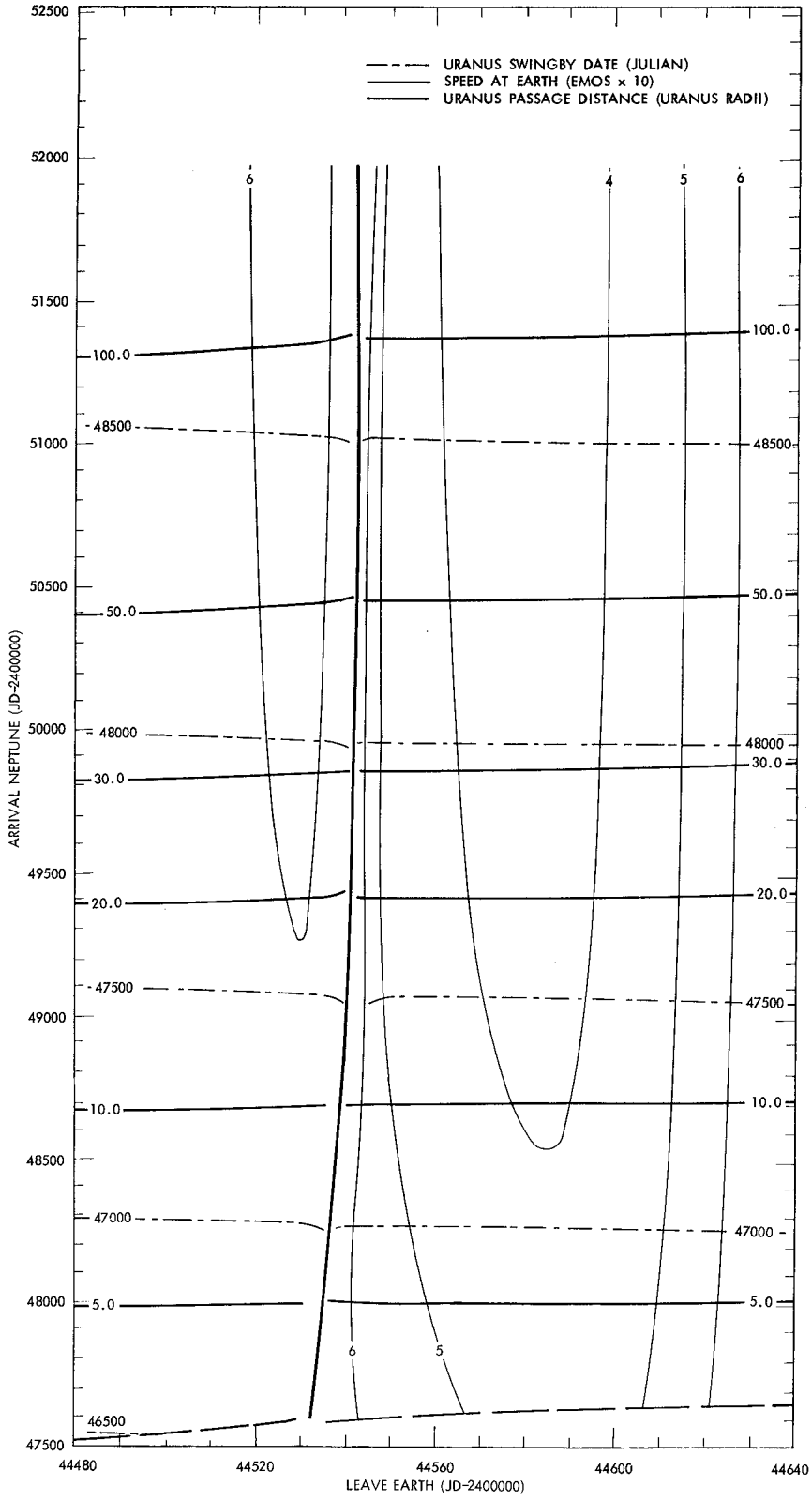

FIGURE 4-5d OUTER PLANET GRAND TOUR-URANUS ENCOUNTER (1980)

APPENDIX

MAGNETIC TAPE DATA DESCRIPTION

The magnetic tape contains a data record for each trajectory contained in the tabular data in the Supplement. In order to make the tape compatible with the 7090/7094 DCS (and at the same time usable with "third generation" computers) a blocked, BCD tape format was used. The tape is set up as follows:

1. 7-track
2. blocked BCD
3. 20 records per block
4. 132 characters per record

An identification record precedes each set of data associated with a particular launch opportunity and target planet, and an end-of-file separates the single-planet swingby data from the grand tour data. Other than this, the data contained on the tape is the same as that printed in the tabular listings (excluding, of course, the parameter headings and separate arrival date). There are three data records per single-planet swingby mission and eight data records per grand tour mission.

The identification record is composed of a 4-digit integer defining the launch year (i.e., 1976, 1977, etc.), a 2-digit integer defining the target planet, and an integer indicating the number of data records following the identification record. The following planet indices are used:

6 = Saturn
7 = Uranus
8 = Neptune
9 = Pluto
88 = Grand Tour Missions

The identification record format is:

Character Number	Field	Definition
1	blank	
2 - 5	I 4	Launch Year
6 - 11	blank	
12 - 13	I 2	Planet Index
14 - 20	blank	
21 - 24	I 4	Number of Data Records
25 - 132	blank	

The format of the trajectory data is given in Tables A-1 (single-planet swingby) and A-2 (grand tour).

TABLE A-1

SINGLE-PLANET SWINGBY DATA STORAGE FORMAT

Character Number	Field	Definition
Records 1 & 2*		
1	blank	
2 - 8	F7.1	DEPART (PASS)
9	blank	
10 - 16	F7.1	PASS (ARRIVE)
17 - 23	F7.3	SPEED
24 - 29	F6.1	RA
30 - 35	F6.1	DECL
36 - 41	F6.2	I 1
42 - 47	F6.3	V 1
48 - 53	F6.1	PSI 1
54 - 59	F6.3	ECCEN
60	blank	
61 - 67	F7.3**	SMA
68 - 73	F6.1	THET1
74 - 79	F6.1	THET2
80 - 85	F6.3	PERIH
86	A1	
87 - 93	F7.3***	APHEL
94	A1	
95 - 100	F6.2	I 2
101 - 106	F6.3	V 2
107 - 112	F6.1	PSI 2
113	blank	
114 - 119	F6.1	RA
120 - 125	F6.1	DECL
126 - 132	F7.3	SPEED
Record 3		
1	blank	
2 - 8	F7.2	DV1
9	blank	
10 - 16	F7.2	DV2
17 - 23	F7.2	DVT
24 - 27	blank	
28 - 30	A3	LEG1
31	A1	Alphameric: /
32 - 34	A3	LEG2

* Record 1 contains the data for the Earth-Jupiter transfer, Record 2 contains the data for the Jupiter-target planet transfer.

** Written as ******* if SMA is less than -99.999 or greater than 999.999.

*** Written as -0.0 if ECCEN is greater than or equal to 1.0.

TABLE A-1 (Cont'd)

Character Number	Field	Definition
35 - 41	F7.1	KAPPA
42 - 47	F6.1	RAS
48 - 53	F6.1	DECLS
54 - 59	F6.3	CDIST1
60 - 67	F8.3	CDIST2
68 - 73	F6.1	RAP
74 - 79	F6.1	DECLP
80 - 86	F7.3	VP
87 - 93	F7.3	-A
94	blank	
95 - 100	F6.3	E
101 - 106	F6.1	INCL
107 - 112	F6.1	LAM1
113 - 119	F7.1	LAM2
120 - 125	F6.1	ETA
126 - 132	F7.3	PERIC

TABLE A-2

GRAND TOUR DATA STORAGE FORMAT

Character Number	Field	Definition
Records 1 - 4*		
1	blank	
2 - 8	F7.1	DEPART (PASS)
9	blank	
10 - 16	F7.1	ARRIVE (PASS)
17 - 23	F7.3	SPEED
24 - 29	F6.1	RA
30 - 35	F6.1	DECL
36 - 42	F7.2	I 1
43 - 48	F6.3	V 1
49 - 54	F6.1	PSI 1
55 - 60	F6.3	ECCEN
61	blank	
62 - 68	F7.3**	SMA
69 - 74	F6.1	THET1
75 - 80	F6.1	THET2
81 - 87	F7.3	PERIH
88	A1	
89 - 94	F6.3***	APHEL
95	A1	
96 - 102	F7.2	I 2
103 - 108	F6.3	V 2
109 - 114	F6.1	PSI 2
115 - 120	F6.1	RA
121 - 126	F6.1	DECL
127 - 132	F6.3	SPEED
Records 5 - 7**** (Character Numbers 1-102)		
1 - 9	blank	
10 - 17	A8	PLANET (name)

* Record 1 contains the Earth-Jupiter transfer data; Record 2, the Jupiter-Saturn data; Record 3, the Saturn-Uranus data; and Record 4, the Uranus-Neptune data.

** Written as ******* if SMA is less than -99.999 or greater than 999.999.

*** Written as -0.0 if ECCEN is greater than or equal to 1.0.

**** Records 5 - 7 contain the encounter data at Jupiter, Saturn, and Uranus, respectively.

TABLE A-2 (Cont'd)

Character Number	Field	Definition
18 - 23	F6.1	KAPPA
24 - 29	F6.1	RAS
30 - 35	F6.1	DECLS
36 - 42	F7.3	CDIST
43 - 48	F6.1	RAP
49 - 54	F6.1	DECLP
55 - 60	F6.2	VP
61 - 62	blank	
63 - 68	F6.3	-A
69 - 74	F6.3	E
75 - 80	F6.1	INCL
81 - 86	F6.1	LAMDA
87 - 89	blank	
90 - 94	F5.1	ETA
95 - 102	F8.3	PERIC
Records 5 & 7 (Character Numbers 102-132)		
103 - 132	blank	
Record 6 (Character Numbers 103-132)		
103 - 107	blank	
108	A1	Alphameric: (
109 - 114	F6.3*	RNODA
115	blank	
116 - 121	F6.3*	RNODD
122	A1	Alphameric:)
123 - 132	blank	
Record 8**		
1 - 17	blank	
18 - 23	F6.2	DV1
24 - 29	F6.2	DV2
30 - 35	F6.2	DVT
36 - 38	blank	
39 - 60	A22	LEG1, LEG2, LEG3, LEG4
61 - 68	F8.1	RAS
69 - 74	F6.1	DECLS
75 - 80	F6.2	CDIST
81 - 86	F6.1	LAMDA

* Written as -0.0 if the encounter trajectory does not intersect the equatorial plane of Saturn.

** Contains mission data and Neptune encounter data.

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